THE

GARDENS' BULLETIN

SINGAPORE

Vol. XIV 15th February, 1955 Part 2

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To be purchased at the Botanic Gardens, Singapore

Price $10

Published by Authority

PRINTED AT THE GOVERNMENT PRINTING OFFICE, SINGAPORE,
BY F. S. HORSLIN, GOVERNMENT PRINTER

1955

MYCOLOGICAL INSTITUTE
28 MAR 1955

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COMMONWEALTH MYCOLOGICAL INSTITUTE
26 MAR 1955

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A Revision of the Malayan Annonaceae

By JAMES SINCLAIR, B.SC.

INTRODUCTION

NO MAJOR publications on the Malayan Annonaceae have appeared after King and Ridley's accounts. Since their time much herbarium material has accumulated and it is now desirable to revise the family. We should be grateful to these authors and to all the other pioneers for their writings on the subject. We are now more fortunate than they since this lapse of time has placed at our disposal more facts, more material and new scientific concepts.

The present is another account but it cannot pretend to be comprehensive. There are still too many disturbing and puzzling questions to be solved but it is hoped to solve some of them in the future. Where more information is required or where certain statements appear to be doubtful, then such points are mentioned in the notes after the description of the species. There are still some imperfectly known species lacking either flower or fruit. A good deal of living material has been seen and when such was available, it was possible to add colour notes not mentioned in any of the text-books or papers.

More material is still required. There are several species which have only once been collected and it is essential to know more about their distribution. Flowers are more important than fruits for identification while sterile material is sometimes not of much use. In some cases as is pointed out later, it is of no value.

SUMMARY OF TRIBES, GENERA, SPECIES, NEW COMBINATIONS AND DIFFERENCES BETWEEN RIDLEY'S FLORA AND THIS PRESENT REVISION

In the present revision there are 38 genera, 198 native and 5 cultivated, exotic species making a total of 203 species besides 17 varieties. Ridley has 30 genera, 180 native species and mentions 4 cultivated exotics making a total of 184 with 6 varieties.

The tribes used in the present revision are the same as those of Ridley. The genera placed in each tribe agree in the main with Ridley's grouping but the following changes are noted:—

GENUS	*SINCLAIR*	*RIDLEY*
Kingstonia	Uvarieae	Miliuseae
Rauwenhoffia	Uvarieae	Xylopieae
Anaxagorea	Xylopieae	Unoneae
Sphaerocoryne	Xylopieae (as Melodorum)	Unoneae
Mezzettia	Unoneae	Miliuseae
Orophea	Miliuseae	Mitrephoreae

Reasons for these changes are given in the Systematic Part of this revision under the sections dealing with these genera. Comparative lists are appended here of the tribes, genera and species in Ridley's and the present revision:—

Genera and Species in the Present Flora

TRIBE 1. UVARIEAE	
Sageraea	2
Stelechocarpus	1
Kingstonia	1
Enicosanthum	7
Trivalvaria	3
Uvaria	11 + 1 var.
Cyathostemma	7
Rauwenhoffia	1
Ellipeia	1
	34 + 1 var.

TRIBE 2. UNONEAE	
Cyathocalyx	8
Artabotrys	13 + 1 planted species
Desmos	7 + 1 var.
Monocarpia	1
Oncodostigma	1
Meiogyne	1
Polyalthia	31 + 5 vars. + 1 planted species
Cananga	2 + 1 var.
Mezzettia	3
Disepalum	2 + 1 var.
	71 + 8 vars.

TRIBE 3. XYLOPIEAE	
Xylopia	8 + 1 var.
Anaxagorea	1 + 2 vars.
Fissistigma	8 + 1 var.
Pyramidanthe	1
Mitrella	1
Melodorum	2
	21 + 4 vars.

TRIBE 4. MILIUSEAE	
Marsypopetalum	1
Phaeanthus	2
Miliusa	3
Alphonsea	7
Platymitra	1
Orophea	8
	22

TRIBE. 5. MITREPHOREAE		TRIBE 6. ANNONINEAE	
Pseuduvaria	8 + 3 vars.	Annona	3 (cultivated)
Neo-uvaria	2		
Goniothalamus	21		
Oxymitra	12		
Mitrephora	2		
Popowia	7 + 1 var.		
	52 + 4 vars.		

Total

Genera 38
Species 198 native + 5 cultivated species = 203
Varieties 17

Genera and Species in Ridley's Flora

TRIBE 1. UVARIEAE		TRIBE 2. UNONEAE	
Sageraea	2	Cyathocalyx	2
Stelechocarpus	2	Drepananthus	3
Griffithia	3	Artabotrys	13 + 1 planted species mentioned
Uvaria	14 + 1 var.		
Cyathostemma	4 + 1 var.	Anaxagorea	2
Uvariella	1	Desmos	6 + 1 var.
Ellipeia	1	Polyalthia	35
		Canangium	4
	27 + 2 vars.	Sphaerocoryne	1
		Disepalum	1
			68 + 1 var.

TRIBE 3. MITREPHOREAE		TRIBE 4. XYLOPIEAE	
Goniothalamus	15 + 1 var.	Xylopia	14
Orophea	8	Melodorum	13 + 1 var.
Oxymitra	7	Rauwenhoffia	1
Mitrephora	4		
Popowia	10		28 + 1 var.
	44 + 1 var.		

TRIBE 5. MILIUSEAE		TRIBE 6. ANNONINEAE	
Phaeanthus	2	Annona	3 cultivated species mentioned only
Miliusa	3		
Alphonsea	5 + 1 var.		
Kingstonia	1		
Mezzettia	3		
	14 + 1 var.		

Total

Genera 30
Species 180 + 4 cultivated or planted species = 184
Varieties 6

New Species and New Varieties

The following 18 are new species:—

Enicosanthum membranifolium, E. praestigiosum, Polyalthia lateritia, P. brunneifolia, Alphonsea johorensis, A. Kingii, Pseuduvaria taipingensis, P. monticola, P. galeata, P. nervosa, P. cerina, Goniothalamus Holttumii, G. calycinus, G. montanus, G. umbrosus, Oxymitra Kingii, O. alpina, O. argentea.

The following 4 are new varieties:—

Popowia tomentosa var. *crinita, Pseuduvaria setosa* var. *major, P. macrophylla* var. *sessilicarpa* and var. *cymosa.*

New Records

The following 11 are new additions to the flora of Malaya and are not recorded in Ridley's Flora:—

Cyathostemma argenteum, see Sinclair in Sarawak Mus. Journ. Vol. 5 No. 3 (1951) 599, *Marsypopetalum pallidum, Pseuduvaria rugosa, Orophea palawanensis, Platymitra siamensis, Goniothalamus Macranii, G. tavoyensis* (Lower Siam), *Mitrephora vulpina, Oxymitra borneensis* var. *sumatrana, Desmos Teysmannii. Polyalthia socia.*

New Names

Polyalthia hirta Ridley becomes *Polyalthia hirtifolia* Sinclair and the Philippine *Saccopetalum longipes* Vidal becomes *Miliusa Vidalii* Sinclair.

New Combinations

The following 18 are new combinations:—

Enicosanthum macranthum (King), *Trivalvaria nervosa* (Hk. f. et Th.), *Cyathostemma micranthum* (A. DC.), *C. excelsum* (Hk. f. et Th.), *Cyathocalyx Ridleyi* (King), *C. pruniferus* (Maingay ex Hk. f. et Th.), *C. pahangensis* (Hend.), *C. Scortechinii* (King), *C. olivaceus* (King), *C. carinatus* (Ridley), *Polyalthia glabra* (Hk. f. et Th.), *Disepalum pulchrum* (King), and var. *angustifolium* (King), *Xylopia sub-dehiscens* (King), *Fissistigma latifolium* var. *ovoideum* (King), *Pyramidanthe prismatica* (Hk. f. et Th.), *Phaeanthus ophthalmicus* (Roxb. ex Don) and *Monocarpia marginalis* (Scheff.).

The following receive new status:—

Polyalthia cauliflora var. *Beccarii* (King), var. *desmantha* (Hk. f. et Th.), var. *Wrayi* (Hemsl.), *P. Motleyana* var. *oblonga* (King), *Xylopia ferruginea* var. *oxyantha* (Hk. f. et Th.).

The following 8 new combinations relating to Non-Malayan *Annonaceae* have been made during the course of this work:—

Cyathocalyx apoensis (Elm.), *C. philippinensis* (Merr.), *Miliusa tomentosa* (Roxb.), *M. longiflora* (Hk. f. et Th.), *M. unguiculata* (C. E. C. Fischer), *M. arborea* (Elm.), *M. Koolsii* (Kostermans), *Pseuduvaria Dielsiana* (Lauterb.).

The following new genus has been made for *Monocarpia siamensis* which is not a true *Monocarpia*:—*Dasoclema.*

Summary of main changes made in the present revision

Some of Ridley's species have been reduced, or transferred to other genera or entirely eliminated. Of his genera, *Uvariella* is eliminated and a few others are split into two or three. *Drepananthus* is united with *Cyathocalyx*. The reasons for these changes will be found in the systematic section. The following tabulation will show the main changes in this revision:—

RIDLEY'S GENUS	*SINCLAIR'S TREATMENT AND CHANGES*
Stelechocarpus ..	One sp. *P. punctatus* eliminated. See systematic notes. *S. nitidus* is made a syn. of *cauliflorus.*
Griffithia	*Enicosanthum* used instead. *Polyalthia congregata* and *P. macrantha* transferred to this genus.
Cyathostemma ..	*Uvaria micrantha* and *U. excelsa* transferred to this genus.
Uvaria	*U. Ridleyi* and *U. astrosticta* reduced to syns. of *U. rufa. U. sub-repanda* is *U. Lobbiana.* 2 species (see above) transferred to *Cyathostemma.* The older names *U. javana, grandiflora* and *cordata* used for *U. dulcis, purpurea* and *macrophylla* respectively.
Uvariella	The genus is eliminated and *Uvariella leptopoda* transferred to *Uvaria.*
Cyathocalyx ..	*C. virgatus* placed in *Meiogyne. C. Maingayi* placed in *Monocarpia.*
Drepananthus ..	United with *Cyathocalyx.*
Canangium ..	The name *Cananga* used. *C. Scortechinii* reduced to *C. odorata. C. monosperma* is placed in *Oncodostigma.*
Polyalthia ..	*P. Wrayi, desmantha* and *Beccarii* as vars. of *P. cauliflora. P. pycnantha* reduced to *cauliflora. P. velutinosa* a syn. of *P. cinnamomea. P. oblonga* as a var. of *P. Motleyana. P. Curtisii* a syn. of *P. glabra. P. glomerata* a syn. of *P. clavigera. P. macrantha* and *P. congregata* transferred to *Enicosanthum. P. pulchra,* transferred to *Disepalum.* For *P. Kunstleri, P. Scortechinii* and *P. canangioides* see notes under *P. Rumphii. P. hirta* Ridley becomes *P. hirtifolia* Sinclair.
Sphaerocoryne ..	Transferred to *Melodorum* (see notes).

Anaxagorea ..	*A. luzonensis* not included, not found in Malaya. *A. Scortechinii* is a syn. of A. javanica.
Goniothalamus ..	*G. caudifolius* and *Kunstleri* included in *tenuifolius*. *G. pendulifolius* included in *G. uvarioides*.
Orophea	*O. setosa* transferred to *Pseuduvaria*. *O. gracilis* is reduced to *O. polycarpa*.
Mitrephora ..	Genus divided into *Mitrephora* and *Pseuduvaria*. *M. macrophylla* transferred to *Pseuduvaria*, also *M. reticulata* but true *reticulata* not found in Malaya. *M. crassipetala* is *Anaxagorea javanica*.
Popowia	*P. ramosissima* is syn. of *pisocarpa*. *P. foetida* transferred to *Neo-uvaria*. *P. nervifolia*, *P. nervosa*, *P. pumila* transferred to *Trivalvaria*.
Oxymitra	*O. affinis* split into two species *viz. O. affinis* and *O. Kingii*.
Melodorum ..	The majority of species placed in *Fissistigma*. *M. elegans* and *pisocarpum* = *Mitrella Kentii*. *M. prismaticum* placed in *Pyramidanthe*. *M. Maingayi* and *M. cylindricum* reduced to syns. of *Pyramidanthe prismaticum* (see notes).
Xylopia	Several species transferred to *Cyathocalyx* e.g. *X. Curtisii*, *X. olivacea*, *X. Scortechinii* and *X. Ridleyi*. One species *X. dicarpa* is *Alphonsea Kingii*. *X. pustulata* is *X. malayana*. *X. oxyantha* reduced to a var. of *X. ferruginea*.
Phaeanthus ..	*P. nutans* is a syn. of *P. ophthalmicus*. *P. lucidus* is a syn. of *P. crassipetalus*.
Alphonsea ..	*A. Maingayi* var. *elliptica* is restored to specific rank. A. *sub-dehiscens* is transferred to *Xylopia*.

From the foregoing tabulations one can see at a glance the main changes which have been made and how this revision differs from Ridley's Flora.

GENERAL CHARACTERS

Habitat and Distribution

Annonaceae are confined mostly to moist tropical lowland forests. They are more plentiful in the Old World than in the New. They are not found in Europe. The only genus extending for any distance into the temperate zone is *Asimina* which occurs in Eastern America as far north as the Great Lakes. In Malaya *Annonaceae* are abundant in the forests but become scarcer above 2,000 feet elevation. There are a few mountain species however which are not met with in the lowlands. These are:—*Disepalum pulchrum* (5,000 ft. or more), *D. anomalum* (1,500 ft.), *Oxymitra alpina* (over 4,000 ft.), *Goniothalamus Holttumii*, (over 4,000 ft.), *G. montanus* (2,500 ft.), *Pseuduvaria taipingensis* (4,000 ft.), and *P. monticola* (5,000 ft.).

Xylopia, the second largest genus after *Uvaria,* is an example of one of the few instances of inter-continental distribution. (Malayan Region including Ceylon and N. Guinea, Africa, Central and S. America). As an example of disconnected distribution, *Anaxagorea* occurs in Central and S. America and in the Malayan Region. *Uvaria* and *Artabotrys* are common to Africa, Madagascar and the Indo-Malayan Region. *Annona* is abundant and native in the New World with a few species in Africa. There are three species only in Malaya but they were introduced from America into cultivation long ago by the Portuguese.

General Appearance and Morphology

The following Malayan genera are climbers:—

Uvaria, Cyathostemma, Rauwenhoffia, Ellipeia, Artabotrys, Fissistigma, Pyramidanthe, Mitrella, Oxymitra.

The following are climbers or straggling shrubs:—

Desmos and *Melodorum.*

The remainder are shrubs or trees.

The tallest tree is *Mezzettia leptopoda* which may reach 40 m. Other trees reaching 20 m. are:—*Meiogyne,* several species of *Polyalthia* eg. *P. Rumphii, pachyphylla, lateriflora, Hookeriana, hypogaea, sumatrana, glauca* and *cinnamomea, Monocarpia, Cyathocalyx sumatranus, pruniferus* and *Scortechinii, Xylopia malayana, magna, stenopetala* and *ferruginea, Goniothalamus Ridleyi* and *giganteus, Platymitra, Alphonsea elliptica* and *johorensis.*

The smallest Annonaceous shrub in Malaya is *Polyalthia pumila* which is about 30 cm. high.

The division into climbing and non-climbing is an extremely useful systematic character the value of which is often entirely overlooked and innocently or ignorantly forgotten. This character can be observed so easily in the field and if the collector would only make a note of it on his field label, he could often give the systematist a good deal of help. If the specimen sent for identification is a climber and this information is stated then there are only 11 genera to choose from instead of 38. One reliable rule in Malayan *Annonaceae* is that we never find arborescent species in a climbing genus. For example *Monocarpia marginalis* is a good medium-sized tree. Craib put another species, a climber from Siam into the genus and called it *Monocarpia siamensis.* This species, now *Dasoclema siamensis* does not in the slightest resemble the former and was obviously wrongly placed. Another

recent well known present-day botanist placed a certain species in *Uvaria* when it was definitely stated on the label to be a tree. He himself describes it as a tree. No wonder he added in his notes, words to the effect that this is different from all the other *Uvaria* species in our country.

After some acquaintance with the *Annonaceae* the student can readily recognize some of the tree-species at a distance and pick them out from other trees in the forest. *Cyathocalyx* (*Drepananthus*) species are easily recognized by their slender, mast-like trunks with a crown of branches at the top. The branches are slender, rather distant like a *Garcinia* and often nearly horizontal with leaves in two ranks. *Cananga* can also be recognized readily at a distance but the branches are less regular and the trunk not so straight.

Bark

The bark is usually smooth and entire, pale grey or buff to brown. In *Xylopia ferruginea* it is orange-brown. Little information is recorded by collectors on bark characters since these are not popularly considered of use in diagnosis. I am inclined to think that bark characters have been neglected and if studied more fully will reveal astonishing results. There is also scanty information on roots as they do not play any significant part in identification. *Xylopia ferruginea* has stilt roots at the base of the tree, visible above ground, while cork is obtained from the roots of *Annona palustris* (Africa), now known as *A. glabra.*

Twigs

Young twigs are pubescent or tomentose, rarely glabrous. They usually become glabrous sooner or later. In the case of *Polyalthia suberosa,* the older twigs have a corky bark which cracks at intervals. The *Annonaceae* are readily distinguished from other families by the twigs alone, which often have lozenge-shaped striations resembling a sort of trellis work. This is due to the arrangement of the vascular bundles. Another good test is the septate pith with fine horizontal lines of harder tissue (stone cells). Only in some three cases, *Artabotrys spinosus* (Siam), *Annona spinescens* and *A. punicifolia* (New World) do the twigs bear spines.

Buds

Buds are very minute and of no systematic value. Under the very uniform conditions of climate in a moist forest there is no need for large buds, thickened and protected by scales.

Leaves

The leaves are always simple, alternate and entire without stipules. They are membranous, stiffly membranous or coriaceous. The base may be acute, rounded, emarginate, cordate or unequal-sided. The apex is acute, acuminate or less often obtuse. It is emarginate or retuse in *Oxymitra calycina, O. excisa* and *Artabotrys spinosus*. The midrib is sunk above and raised beneath but in *Stelechocarpus, Mezzettia, Cyathocalyx* (*sect. Eucyathocalyx*), *Artabotrys* and to a slight extent in *Trivalvaria,* the upper midrib is flattened and rather broad, especially at the base; it is flush with the surface of the leaf and not sunk. The veins may be straight and nearly parallel or curved, running out to the edge. They often however, anastomose with each other and form an intra-marginal loop or there may be a double loop. Simple and sometimes stellate hairs are present. Stellate hairs are found in *Uvaria, Rauwenhoffia* (best seen in young leaves), *Neo-uvaria, Cyathostemma excelsum* and in *C. argenteum* when very young, the other species of *Cyathostemma* are glabrous; *Cyathocalyx* (some of the species in section *Drepananthus,* other species are glabrous), in *Dasoclema siamensis* and *Pachypodanthium* (Trop. Africa).

In certain cases and sometimes in the keys in this revision, leaf characters are used to distinguish species. If one is very familiar with the Malayan *Annonaceae* through the constant handling of herbarium sheets he can identify sterile specimens with a fair degree of accuracy but there are a number of cases in which his attempt will only be a guess. The leaves of certain species look exactly alike and I defy any one to differentiate between leaves of *Goniothalamus giganteus* and *G. malayanus*. Young leaves of *Uvaria grandiflora* and *U. javana* look very much alike. The leaves of *Enicosanthum* species, those of certain *Polyalthia* species such as *P. hypogaea, P. lateriflora, P. pachyphylla* and *P. sclerophylla* and *Kingstonia* all resemble each other and in such cases it is better to wait until flowers and fruit are available. *Polyalthia Rumphii* and *P. Jenkensii* resemble each other, similarly *P. macropoda* and *P. clavigera*. More difficult still in the sterile state are *P. sumatrana, P. hypoleuca* and *P. glauca. Artabotrys* has several species the leaves of which look exactly alike. With the exception of *A. Wrayi* it is better not to attempt to identify sterile material of this genus. *A. venustus* and *A. crassifolius* are extremely troublesome. *Orophea* is another genus which will present difficulties.

Annonaceous material with juvenile leaves has been sent to me for identification. This is extremely difficult because specimens with juvenile leaves are seldom preserved in herbaria and few

botanists have even seen them. Young plants of *Artabotrys suaveolens* bear much narrower leaves than in the adult. I have not seen juvenile leaves of the other *Artabotrys* species but most probably they bear elongated leaves of a similar kind. I have seen *Cyathostemma viridiflorum* and *C. Wrayi* bearing on the same plant two kinds of leaves, the one kind about four times larger than the other.

Leaves then are useful in identification but will not alone serve to identify all the species. They should be looked on as an aid and not as an end to identification and when employed in conjunction with some floral or fruiting character can be of immense value. A combination of certain diagnostic characters plus some common sense rather than a single character will achieve the most accurate results in critical determinations.

The Inflorescence

Whether the inflorescence is axillary or extra-axillary is very important, a character hitherto neglected or little stressed in the identification of species. More attention should be paid to the position of the inflorescence and this character if used in conjunction with other characters, will be of immense value. If a genus has axillary flowers then this character with respect to all its species is constant and we rarely find any one member departing from this condition. If so it has usually been placed in the wrong genus. However one or two observations may be noted here as they may have significance. *Desmos* has extra-axillary flowers while the species in section *Dasymaschalon* have them axillary. This may be a good reason for maintaining *Dasymaschalon* distinct from *Desmos* as several botanists have done. I have not separated them for other reasons (see systematic section). In *Orophea* the flowers can be axillary or supra-axillary on the same plant but this is the result of increased growth of the axis. In *Miliusa* they are axillary but again by growth of the peduncles and axis they may appear extra-axillary (see notes). It is not unusual to find several conditions in the large genus *Polyalthia,* axillary, extra-axillary or cauliflorous on both short or long shoots (subterranean in *P. hypogaea* and in *Geanthemum* Trop. Amer.). In the case of cauliflory, the pedicels probably arise in the axils of minute bracts or scales. Cauliflory is found in several unrelated genera.

The solitary flower is very common in *Annonaceae* eg. *Goniothalamus, Miliusa, Desmos, Oxymitra, Pseuduvaria,* and in several species of *Polyalthia* etc. In other cases two or three subsequent flowers may arise but only one appearing at a time. When the

flower is not solitary, the inflorescence is most often a few-flowered cyme, usually condensed, eg. *Uvaria*. True racemes appear to be absent but we may get racemose-cymes or panicles as in *Fissistigma*.

Both peduncles and pedicels may be present but usually pedicels only. When present, peduncles are usually shorter than the pedicels except in *Cyathostemma viridiflorum*. In *Cyathocalyx* the peduncles are decurrent. In *Artabotrys* they are also decurrent but much larger and are flattened, woody and hooked. By this means the plant can also climb. Other genera having peduncles are *Cananga, Monocarpia, Alphonsea, Phaeanthus, Orophea, Mitrephora, Miliusa* (peduncles sometimes leafy) and some species of *Xylopia* and *Polyalthia* (woody tubercles as peduncles in *Polyalthia*). Pedicels usually average 2–3 cm. in length but they are very long and slender in *Oxymitra filipes* (7·5–10 cm.), *Desmos cochinchinensis* (10–16 cm.) and *D. filipes* (25–30 cm.). The longest pedicels of all are found in *Thonnera* (Belgian Congo, 30–40 cm.). The flowers are sessile in *Trivalvaria macrophylla* and subsessile (pedicels 2–3 mm. long) in *Polyalthia hirtifolia, P. parviflora, Meiogyne virgata,* and *Oxymitra discolor*.

In fruit pedicels become stouter and may elongate slightly. They usually bear 1–2 minute, basal, acute bracts with a further similar median or sub-median one. If the pedicel is very short the bract will appear at the base of the calyx. In *Goniothalamus* and *Alphonsea* there are several imbricate, distichous bracts at the base of the pedicel. In *Artabotrys* the bracts are caducous. In *Uvaria* the bracts are sub-foliar, the largest being found in *U. grandiflora* where they are 2–3 cm. long. The following list of axillary and extra-axillary inflorescences is appended.

Flowers axillary or from axils of fallen leaves

Sageraea, Enicosanthum, Kingstonia, Oncodostigma, Meiogyne, Desmos section *Dasymaschalon, Polyalthia* section *Monoon* except cauliflorous species and part of section *Eu-Polyalthia, Cananga, Mezzettia, Xylopia, Pyramidanthe, Mitrella, Melodorum* (often terminal), *Miliusa* (or by growth sometimes appearing extra-axillary), *Pseuduvaria, Neo-uvaria, Goniothalamus, Platymitra, Orophea* (sometimes supra-axillary).

Flowers extra-axillary, terminal or in terminal panicles

Trivalvaria, Uvaria, Cyathostemma, Rauwenhoffia, Ellipeia, Cyathocalyx, Artabotrys (pedicels on woody, hooked peduncles), *Anaxagorea* (often terminal), *Desmos, Monocarpia, Polyalthia*

(part of section *Eu-Polyalthia*), *Disepalum* (terminal), *Fissistigma* (terminal panicles), *Marsypopetalum, Phaeanthus, Alphonsea, Popowia, Oxymitra, Mitrephora.*

Flowers, Size and Scent

Among the Malayan species the smallest flowers occur in *Popowia pisocarpa* (3–4 mm. in diam.), *Xylopia caudata* (5 mm. long), *Cyathostemma micranthum* (5–8 mm. in diam.) and certain species of *Orophea* and *Pseuduvaria* (3–5 mm. long).

The majority however have medium sized flowers 2–4 cm. long. Among the large flowered species, *Goniothalamus giganteus* has petals 8–15 cm. long and 4·5–9 cm. broad. The flower of *Uvaria grandiflora* is probably the most conspicuous; when fully expanded it measures over 10 cm. across, the petals being deep red and the stamens pale yellow. Flowers with long, linear, narrow petals are found in several genera. *Cyathocalyx Ridleyi* and *Xylopia magna* have petals 10 cm. long and 2 or 3 mm. broad. In *Pyramidanthe* they are 5–8 cm. long while the Chittagong-Assam *Desmos longiflora* has ones 10–15 cm. long. Other genera with conspicuous flowers are the West African *Hexalobus* and *Monodora,* some species of which have petals 10 cm. long.

The size of flowers is often incorrectly stated in Ridley's and other floras. This is not accidental since in *Annonaceae* sepals and petals unfold early and may spread slightly giving the false impression that the flower is mature. This applies especially to dried material. In actual fact at this stage the petals grow rapidly in length and only reach their full size when the pistils and stamens are ripe. They then fall rapidly and usually only last a day on the ripening of the stamens. I have gathered specimens of *Xylopia ferruginea* with mature and nearly mature flowers and placed them in water at night with a view to making a drawing on the following day. In the morning the petals had nearly all dropped off. Fresh specimens intended for the herbarium should be poisoned at once to prevent the petals falling and measurements of mature petals should be taken from those fallen on the forest floor.

The *Annonaceae* are well known for their scented flowers but more information on this subject is required. For the majority of Malayan species nothing has been recorded. Collectors should in future at least state whether the flower is scented or not. The exact description of the odour does not matter so much as no two people will describe an odour in the same terms. Perhaps the best known species with fragrant flowers is *Cananga odorata* from which a perfume is distilled. *Cyathocalyx Ridleyi* has a similar but more refined odour.

The following also have a sweet odour:—

*Enicosanthum magnoliiflorum, E. cupularis, E. macranthum, *Cyathostemma Hookeri, *Anaxagorea javanica, *Fissistigma fulgens, *F. manubriatum, Alphonsea elliptica, Xylopia malayana, *X. ferruginea, *X. sub-dehiscens, *Artabotrys suaveolens, Oxymitra filipes, *Goniothalamus tapis.*

Sepals

The sepals are not of much use as a diagnostic character except when they are reduced to 2 in number or are imbricate. They are normally 3 in number but sometimes are reduced to 2, following a reduction in the number of petals.

The following Malayan *Annonaceae* have 2 sepals:—

Disepalum anomalum, Anaxagorea javanica var. *dipetala. Tetrapetalum* from Borneo has 2 sepals.

Imbricate sepals distinguish the following genera from the remaining which have valvate sepals:—Malaya, *Stelechocarpus, Sageraea, Enicosanthum, Kingstonia, Trivalvaria;* Trop. America. *Malmea, Oxandra.*

In shape the sepals are triangular, ovate-triangular, linear or less often rotund. They may be free or united at the base, the apex may be acute or obtuse. In *Pyramidanthe* they are connate and form a collar, their apices vestigial or absent. In texture they are membranous, coriaceous or fleshy. They are usually pubescent or tomentose outside and glabrous inside. The entirely glabrous state is less common. In *Melodorum* and *Goniothalamus* they are persistent in fruit; in the latter genus they are often large and membranous with a network of veins. They are usually smaller than the petals but in *Miliusa, Phœanthus* and *Marsypopetalum,* they are equal and similar to the petals.

Petals

(*a*) *General*

The petals are of greater diagnostic value in the *Annonaceae* than any other organ. They show such a wonderful diversity in size and form that it may be said the peculiarities of the family are exhibited in its petals. In fact they are the main basis of classification of the whole family. They divide the *Uvarieae* from the other tribes since they are imbricate in that tribe and valvate in the others. The presence normally of 2 whorls of 3 alike or unlike in

* *Popowia fusca* has a somewhat foetid odour. Those marked with a star I have personally attested.

size and form is extremely useful and from the combinations resulting, the valvate forms can be grouped into the tribes:— *Unoneae, Miliuseae, Mitrephoreae* and *Xylopieae.* Less often are they reduced in number or is a whorl missing. This condition is also used to advantage in classification as the following will show:—

Disepalum anomalum (4), *Anaxagorea javanica* var. *tripetala* (3), *A. javanica* var. *dipetala* (2), *Desmos dasymaschalus* (3), *D. filipes* (2).

Other genera, non-Malayan with less than 6 petals are *Tetrapetalum* (4)—Possibly this genus could be included in *Uvaria* since *Disepalum, Anaxagorea* and *Desmos* which have a reduction also have species with the normal number. In fact the typical form of *Anaxagorea javanica* has the normal number.

Annona-Certain species—*A. reticulata* and *A. squamosa* (3) and others

Enantia (3)—Petals are opposite the sepals
Dennettia (3)—Petals alternate with the sepals } Trop. Africa
Monanthotaxis (3)

(*b*) *Colour*

The commonest colour of the petals is yellow. Yellow petals are often greenish-yellow before they mature. They become black when decayed or dried. White and green are also common. *Uvaria* species are usually red or purple, also *Miliusa* and certain species of *Polyalthia.* The petals of *Monodora* are striking——yellow mottled with red or yellow mottled with purple streaks. The texture may be membranous but more often it is fleshy or coriaceous. They may be glabrous, pubescent or tomentose. If pubescent or tomentose they are usually glabrous at the base inside where they touch the stamens or the outer whorl of petals.

(*c*) *Shape*

The shape is very diverse indeed, ovate, triangular, oblong, elliptic, linear, filiform, rotund, spathulate, strap-shaped or combinations of some of these shapes. Both sets may be flat or as in *Anaxagorea* and *Mitrella,* thickened and concave inside or triquetrous. In most species of *Xylopia* and *Fissistigma* the inner are triquetrous and the outer triquetrous only at the tips. Some species of *Cyathocalyx* and *Artabotrys* have the inner terete while *A. costatus* and *A. suaveolens* have both sets terete. Filiform, linear or narrowly lanceolate petals or those drawn out at the tips tend to be slightly twisted eg. *Goniothalamus tortilipetalus, Desmos*

dasymaschalus, D. filipes, D. longiflorus, Pyramidanthe prismatica, Xylopia magna, Cyathocalyx Ridleyi and *Oxymitra filipes,* or slightly falcate as in *Xylopia* species with elongated petals.

The apex is usually acute but obtuse petals are also common, eg. *Uvaria Lobbiana* and *Ellipeia cuneifolia. In Alphonsea, Phaeanthus* and *Miliusa,* the inner petals have their apices slightly recurved. In *Cyathostemma, Uvaria Hamiltonii, U. Hookeri* and *U. narum* both sets are incurved at the apex while in *Popowia* only the inner set is incurved. The margins (of the inner set) are inrolled in *Cymbopetalum* and wavy or crispate in *Hexalobus* (both sets), *Monodora* (outer set) and *Mitrephora Maingayi* (outer set).

(d) Blade and Claw

The most primitive type of petals where there is no distinction between blade and claw is found in *Uvaria, Ellipeia, Kingstonia, Sageraea* and *Stelechocarpus.* Other genera of the *Uvarieae* possess a small claw or the petals are at least narrowed at the base, e.g. *Cyathostemma, Rauwenhoffia* and *Trivalvaria.* In some species of *Enicosanthum* especially in *E. praestigiosum,* the thick, fleshy petals are geniculate but not clawed. The knee-like portion of the inner is convex on the inside of the petal and concave on the outside or back. The knee of the outer petal fits into this concavity while the knee of the inner presses over the sexual organs. This condition is also seen in *Desmos chinensis, D. cochinchinensis* and a few others and in some species of *Polyalthia.* It is seen in an exaggerated degree in *Artabotrys* and *Cyathocalyx* where there are distinct claws and where the petals of both series press much more closely over the sexual organs. There is a resulting constriction at the junction of the blade and the claw. The claws are orbicular and on the inside they are concave. When the flower matures the three inner petals fall as one piece. *Cyathocalyx* and *Artabotrys* are probably the most advanced in the *Unoneae.* In a good many species of Polyalthia there is still no distinction into blade and claw but some do possess a small claw. Often the blade merges gradually into the narrowed base. In *Meiogyne* the petals taper from a broad base to the apex. There is no claw. In the remaining Malayan *Unoneae* claws are absent or ill-defined generally. In the *Xylopieae* there is quite often a clearer distinction between the two portions especially in *Fissistigma* and still more in *Xylopia.*

The climax of development however is reached in the *Mitrephoreae* in genera such as *Mitrephora* and *Pseuduvaria.* Here the claw of the inner petals is long and narrow and the blade hastate, diamond-shaped (playing card) or spathulate. In *Pseuduvaria* the vaulting of the inner petals into a dome is very distinct. The edges

of their blades adhere to give the dome effect while their pillar-like claws are free. In *Goniothalamus* and *Oxymitra* the blades also adhere but the arches beneath are not quite so high or distinct. In *Mitrephora* and *Orophea* the blades are at first united but separate later. The inner petals are often saccate at the base in *Miliusa* and *Alphonsea.*

(*e*) *Size*

Size has been mentioned under the heading "Flowers, Size and Scent". In the *Miliuseae* the outer petals are of the same size and are similar in form to the sepals. The inner are much longer.

(*f*) *Spreading or erect*

In the *Uvarieae* and *Unoneae* the petals usually expand and spread but there are a few exceptions. *Cyathostemma* is separated from *Uvaria* by the fact that the petals do not expand but form globose flowers. In *Ellipeia* they remain erect while in *Anomianthus* the inner are erect. In *Cyathostemma* and *Artabotrys* as previously stated the inner connive over the sexual organs but the greater part of the blades spread. In *Desmos* section *Eu-Desmos,* the petals connive slightly over the sexual organs at first and later spread. In *Uvaria grandiflora* and *U. hirsuta* the petals become reflexed just before they fall. In *Fissistigma* and *Xylopia* the outer petals are at first erect and spread slightly later. The inner remain erect, touch each other and very seldom spread.

In the *Miliuseae* the outer spread, the inner are erect and adhere at first by their edges but later are free or partially free.

(*g*) *Appendages*

Artabotrys petals have a projecting rim on the inside where the blade joins the claw.

Rolliniopsis (Trop. Amer.) petals winged on the back.

Anomianthus (Siam) the inner have two glands at the base.

Monodora (Trop. Afr.) the inner with a pair of hairy lateral appendages about the middle.

Rollinia (Cent. and Trop. S. Amer.) the outer have a thick spreading appendage.

(*h*) *Union of Petals*

Popowia fusca (Malaya) both sets are united at the base and the corolla falls as one piece.

Monodora (Trop. Afr.) both sets united at the base into a short tube.

Rollinia (Cent. and Trop. S. Amer.) connate at the base.

Hexalobus (Trop. Afr., Madag.) connate at the base into a distinct tube.

Papualthia (N. Guinea) connate at the base into a distinct tube.

Asteranthe (E. Afr.) connate at the base into a distinct tube.

Cardiopetalum (Brazil) connate at the base into a distinct tube.

Stamens

Some undue stress has been placed on the stamens as an aid to classification. Usually the expert botanist will have arrived at the correct name for the genus long before he has looked at the stamens.

Normally the stamens in *Annonaceae* are numerous, arranged in spirals on a convex or slightly flattened torus. In the following more advanced genera there tends to be a reduction in number:—

Miliusa	Stamens many to few			
Orophea enterocarpa ..	Stamens	6–12	Staminodes	6
O. maculata ..	„	6	„	3
O. cuneiformis ..	„	6	„	3
O. hirsuta	„	6	„	0
O. polycarpa ..	„	6	„	0
O. hastata	„	10	„	0
O. dodecandra ..	„	12	„	0
O. palawanensis ..	„	12	„	0
Bocagea	„	few	„	0

The filament is very short, inconspicuous or absent. The remarkable part of the stamen is the connective. Its apex may be oblique, truncate, flat-topped, two-lobed with a little depression in the middle, convex, conical or produced into a long point. The 4 extrorse pollen sacs are vertically elongated and lie in pairs dorsally or laterally on the main elongated body of the connective. The commonest type of stamen found in most genera is the uvarioid where the connective hides the anther cells like the eaves of a roof when viewed from above. In contrast to this we have the other type, the miliusoid, found in the *Miliuseae* and in *Orophea* where the connective does not hide the anther cells. Here it may be slightly produced between the two anther lobes on each side of it. In *Popowia* and *Clathrosperma* there may be forms intermediate between the two types.

In the primitive genus *Sageraea,* the massive, flat-topped connectives are produced laterally and the relatively small pollen sacs lie embedded in connective tissue.

The connectives are of some diagnostic value for a few genera besides the ones mentioned. It is useful to remember that they are slightly apiculate in *Alphonsea* and in a good many species of *Goniothalmus*. In *Cananga* they are produced to one third the length of the stamen. A good diagnostic character for *Oxandra, Cardiopetalum* and *Xylopia* is the transversely septate anther cells. In the latter genus and in *Goniothalamus* the pollen grains are large and their tetrads can be easily seen under a hand lens.

Staminodes are present in *Fusaea, Anaxagorea* and in some species of *Uvaria* and *Orophea*. In *Uvaria* they are petaloid with a narrow blade. As a rule it is the outer stamens which are thus modified but in *Anaxagorea* it is the inner which have become altered. *Sageraea* and *Orophea* sometimes have unisexual flowers while *Pseuduvaria* always has. In the female flowers of the latter I have noticed that the staminodes sometimes have one or two fertile sacs.

Torus

In some species of *Xylopia* the torus may be slightly concave. It is convex, conical or flattened slightly in all other *Annonaceae*.

Ovary, Style and Stigma

The ovaries are usually oblong, cylindric, terete or angled and occasionally slightly falcate. They are flask-shaped in *Mezzettia*. They are usually covered with a pubescent or tomentose indumentum; rarely do we find them glabrous. They are glabrous in *Cananga*. The style may be present or absent. When present it may be short as in *Sageraea, Monocarpia* and *Popowia* or elongated and slender as in *Goniothalamus, Xylopia, Anaxagorea, Cananga, Ellipeia* and *Enicosanthum*. In *Fissistigma* the style passes gradually into the stigmatic portion there being no clear differentiation between the two. In *Piptostigma* (W. Afr.) the styles are united. The style is absent in *Uvaria, Cyathostemma, Meiogyne, Oncodostigma, Alphonsea, Pseuduvaria, Platymitra* and most species of *Polyalthia*. The stigma is usually capitate, sub-capitate or clavate, sometimes linear and bent slightly outwards. In *Artabotrys* it may be rod-shaped or leaf-like. In *Goniothalamus* it is funnel-shaped. In all genera the stigma is split or slightly grooved on the top with the groove continuing down its inner, adaxial side, along the style and down the ovary. If the stigma is fairly broad on top the groove will appear like the letter U or a horse-shoe. The stigma as a result is sometimes 2-lobed on its very top. If funnel-shaped the inner side of the funnel will be split. The lips and the groove are often obscured by copious stigmatic fluid which dries and hardens in herbarium specimens.

In *Meiogyne, Kingstonia, Cyathocalyx* section *Eu-cyathocalyx* and *Monocarpia* the stigma is peltate or disc-shaped. When more than one stigma is present each appears as a separate disc. In *Cananga* and *Cyathocalyx* section *Drepananthus* the stigmas are agglutinated to form one disc. The disc in *Cyathocalyx* (both sections), *Monocarpia* and *Cananga* is lamellated. The capitate stigmas of *Pyramidanthe prismatica* are also minutely lobulate over their entire surface.

Ripe Carpels

The fruit is of considerable importance in the separation of genera but not of species.

In fact the *Annonaceae* are divided into two sub-families, the *Annonoideae* and the *Monodoroideae* on the basis of the fruit alone. In the *Monodoroideae* with its two genera *Monodora* and *Isolona,* the carpels are united into a one-celled ovary with parietal placentation and radiating stigmas. The remainder therefore belong to the *Annonoideae.* While the great majority of these have apocarpous carpels we find a few genera in which the carpels are united into a many-celled syncarp with erect stigmas. Some of these I have put into a separate tribe the *Annonineae* with the genera *Ararocarpus, Annona, Raimondia* and *Rollinia.* Hutchinson makes this a sub-tribe of the *Unoneae.* The remainder might be put into another tribe or sub-tribe but since they have valvate petals I have left them in the *Uvarieae.* They are certainly a derivative of the *Uvarieae* and the most advanced in that group. They are *Pachypodanthium, Annonidium* and *Fusaea.*

In the apocarpus forms the carpels are usually stalked but there are many which are sessile. In the genus *Uvaria* they are usually stalked but in one species, *U. sphenocarpa,* they are sessile and packed so closely together that the fruit looks like a syncarp. In *Goniothalamus Ridleyi* they are also packed closely in a bunch but there are spaces between most of the carpels. In *Pseudannona* the carpels are free but sunk in the torus.

The commonest shape is globose or sub-globose but they may be oblong, oblong-elliptic, cylindric, elongated or less often obovate. They vary from the size of a pea to that of a large apple. The pericarp is usually brightly coloured, orange, various shades of red or purple and black. It may be fleshy as in Uvaria, *Popowia, Polyalthia* or thin-walled as in *Fissistigma rubiginosum, Mitrella* and *Cyathostemma micranthum* or hard, thick and stony as in *Mezzettia, Cyathocalyx, Kingstonia* and *Monocarpia.* The carpels

are indehiscent except in the case of *Anaxagorea,* where the carpels are follicles. In some species of *Xylopia* and *Alphonsea* there is a kind of semi-dehiscence but the carpels do not open by well-defined sutures.

Sometimes the carpel is slightly constricted between the seeds but in *Desmos* the elongated carpels are torulose with one seed in each joint. Carpels may be glabrous, pubescent or tomentose. They may be smooth on the outside or tuberculate. The degree of tuberculation often varies a good deal; the same species may be only slightly rough or entirely covered with warts, e.g.: *Uvaria Lobbiana, U. grandiflora* and *Pyramidanthe prismatica.* In herbarium specimens, e.g. *Xylopia* sp. the wrinkling often seen may be due to shrinkage on drying.

The following Malayan *Annonaceae* have rugose or tuberculate fruits:—

Uvaria grandiflora (slightly), *U. Lobbiana, U. larep, U. leptopoda* (slightly), *U. javana, Cyathostemma excelsum, Alphonsea Kingii, A. johorensis, Fissistigma Kingii* (slightly), *F. latifolia* (slightly), *F. hypoglaucum, Pyramidanthe prismatica, Goniothalamus giganteus, Mitrephora vulpina* (slightly), *Pseuduvaria rugosa, P. taipingensis* (slightly).

The prickles on the fruit of *Annona muricata* are the styles of fused carpels. In *A. squamosa* the fused carpels show as bulges.

Genera and species with carpels reduced to one are readily identifiable. The following list is appended:—

Kingstonia, Cyathocalyx section *Eu-cyathocalyx, Mezzettia, Monocarpia carpels* 1–3, *Xylopia sub-dehiscens, Platymitra* carpels 1–2, *Neo-uvaria foetida* 1–6.

The Seed

Like *Myristicaceae* and *Menispermaceae* the seeds of *Annonaceae* have ruminate albumen. The embryo itself is very small. An aril is present in a good many species but here more observation is required as to its occurrence since it may shrivel up in dried specimens.

Normally there are several seeds in two rows. Double placentation seems to be the rule but if a single row is present as in *Desmos,* this is probably regulated by the exigencies of space and pressure during the swelling of the ovules after fecundation.

Seeds are not a great deal of help in systematic diagnosis and it is only when they exhibit peculiarities or are reduced to one in number that they are useful as a generic character. Sometimes the

same species may have one or more seeds and this may be confusing, e.g. *Uvariella* which is now eliminated. The following have one seed per carpel, a few of them one or rarely two:—

Enicosanthum, Trivalvaria, Melodorum 1 occasionally 2, *Miliusa amplexicaulis, Phaeanthus, Marsypopetalum, Popowia*—not all the species, *P. pisocarpa, P. pauciflora, P. fusca, Neo-uvaria, Oxymitra* 1 rarely 2.

Most of the *Goniothalamus* species have 1 but some may have several. This is useful to remember in distinguishing the rather similar *G. tapis* 1-seeded, from *G. malayanus* 2–5 seeded.

Some Non-Malayan genera with one seed per carpel are *Annonidium, Enantia* and 3 of the 4 genera in the *Annonineae, Annona, Raimondia* and *Rollinia.*

The testa is usually thin and smooth, light to dark brown, rarely black as in *Anaxagorea* and *Mitrella.* It is tuberculate in *Cleistopholis* and pitted in *Mitrella* and *Popowia.*

The seeds of *Richella* are triquetrous and winged.

CLASSIFICATION, RELATIONS OF TRIBES AND EVOLUTIONARY TRENDS

The classification of the *Annonaceae* into tribes is a difficult problem and I do not think there can ever be a satisfactory division in spite of some admirable attempts. This present one should not therefore be regarded as final. The *Annonaceae* form a very uniform series and many of their morphological characters are fairly constant throughout the family. The point to be borne in mind always when determining an Annonaceous genus is not to look for one character by which it will be identified but to depend rather on a combination of characters. In the majority of cases the genera are based on a petal character, variable, plus some other more constant character. The petals in *Annonaceae* vary enormously, more so than any other organ and since there are two sets of petals which may or may not be similar, there must be endless combinations.

The main reason why division into tribes is difficult is best shown by this example. Several genera may have a good many characters in common and would seem to form a very good natural group when unhappily the unity is broken by one of the genera having the main diagnostic character common to a genus in another group. Thus the *Miliuseae* are characterized by having a particular type of stamen. The *Mitrephoreae* are based on the inner petals being mitriform, their claws free and their blades usually united to form a dome. Now *Platymitra* and *Orophea* in

the *Miliuseae* have miliusoid stamens but mitriform corollas and are links between the two tribes. This is unfortunate for those who seek to divide the family up into neat divisions and systematists should not be disappointed when they fail to find good divisions. Nature is not out to create nice clear-cut tribes to suit the whims of the tidy minded.

The *Annonaceae* are thus full of orderly progressions leading from one group to another and it is difficult to find diagnostic characters which one group has and which in the other are lacking. The tribes therefore are somewhat ill-defined with overlapping characters.

There are in the family very noticeable evolutionary trends which have a bearing on classification. Since evolution proceeds neither evenly nor at the same rate, we find genera advanced in some characters and primitive with regard to others. There is a tendency to proceed from simplicity to complexity, e.g. from simple petals with no distinction between blade and claw to the complex dome-shaped petals of the *Mitrephoreae* with their long narrow claws and united blades; from the clumsy stamen with a great deal of connective tissue to a more precise form with a filament and greater development of the pollen sacs. There is a tendency for reduction from many seeds in two rows to a single better nourished seed and also a union of parts to give more protection. The petals become united and the stamens become fewer. The greatest advance of all is where the carpels unite to form a 1-celled ovary with parietal placentation and there is thus a division of the family into two subfamilies, the *Annonoideae* (apocarpous forms mostly) and the *Monodoroideae* with a 1-celled ovary, parietal placentation and gamopetaly (*Isolona* and *Monodora*).

The family can also be divided into two groups, a smaller with imbricate petals and the larger with valvate. (Let us call them *Imbricatae* and *Valvatae*). The first group is the Tribe *Uvarieae* which seems to be the most primitive. It is uniform and easily defined. The remainder, the bulk of the *Annonaceae,* when we take away from it the subfamily *Monodoroideae,* forms a very difficult and heterogeneous assortment which we are obliged to break up as best we may into a varying number of rather ill-defined tribes. Most botanists agree about the *Uvarieae* but it is this remainder (*Valvatae*) which gives trouble. I have used all Bentham and Hooker's tribes but have followed Hutchinson in Kew Bull. (1923) 241 in his division into two subfamilies. Therefore I have modified B. & H's *Mitrephoreae* and *Xylopieae* removing some of their genera. The two systems are here compared.

HUTCHINSON	*SINCLAIR*
Subfamily Annonoideae	Subfamily Annonoideae
Tribe Uvarieae	Tribe Uvarieae
Tribe Miliuseae	Tribe Miliuseae
Tribe Unoneae	Tribe Unoneae
Subtribe 1. Xylopineae	Tribe Xylopieae
Series 1. Hexapetalae	Tribe Mitrephoreae
Series 2. Tetrapetalae	Tribe Annonineae
Series 3. Tripetalae	
Subtribe 2. Annonineae	
Subfamily Monodoroideae	Subfamily Monodoroideae

It will be seen that I have made the *Annonineae* a tribe where Hutchinson puts them into a subtribe. I have divided Hutchinson's very large, rather cumbersome *Unoneae* into three, namely the *Unoneae* proper, *Xylopieae* and *Mitrephoreae*. The latter two seem to be offshoots of the *Unoneae*. It is in connection with these three tribes that the divisions are most ill-defined. I do not like his Series 2 and 3 as they are unnatural divisions containing forms with reduced petals which can quite clearly be assigned to the other tribes.

Very little can be said about the phylogeny of the family and of the tribes. To say that one tribe is descended from a certain other more primitive one is often wild surmise. We can only suggest possible lines of descent but can not prove them. When genera have several characters in common they are usually related and we can often group them together. The possible relationships between genera are discussed in the systematic part of this revision. Let us now briefly consider the separate tribes in turn.

Tribe 1. Uvarieae

The *Uvarieae* are not such a difficult group as the *Unoneae*. Some of them are more primitive than the *Unoneae* but they also have genera which are just as advanced as any in the *Unoneae* especially if the *Annonineae* also with united carpels are to be considered as part of the *Unoneae*. The climax of evolutionary trends is seen in the three genera *Annonidium, Pachypodanthium* and *Fusaea* where the carpels have united but do not go so far as in the *Monodoroideae* where the carpels are united into a one-celled ovary with parietal placentation.

The *Uvarieae* are clearly separable into 2 divisions, one with imbricate and the other with valvate sepals. The imbricate series begins with genera like *Sageraea* and *Stelechocarpus* with many seeds and primitive, clumsy stamens and ends with *Enicosanthum* and *Trivalvaria* where the ovules are reduced to one and the stamens more advanced. In the second series with the valvate

sepals, the largest genus is *Uvaria* with many seeds. Offshoots of *Uvaria* are *Cyathostemma, Rauwenhoffia* and *Ellipeia.* The latter is probably the most advanced as the seeds are reduced to one. The line of ascent continues and at the top of the tree we have *Annonidium* with one ovule and fused carpels. The diagram fig. 1 will give some indication of the evolutionary trends and the relationship of one genus to another.

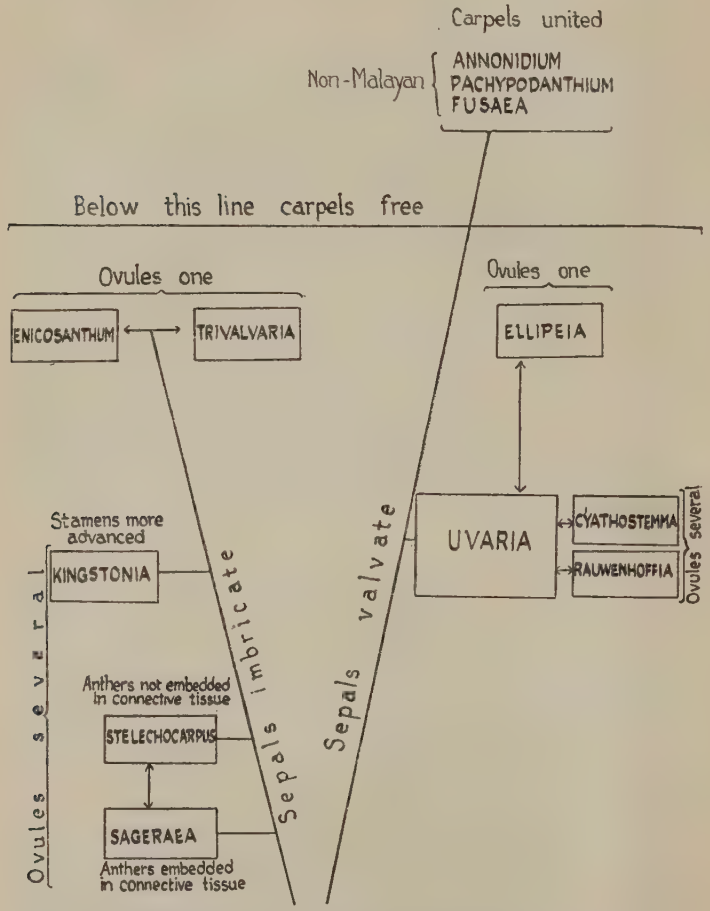


Fig. 1. Relationships and evolutionary trends in the tribe *Uvarieae.* (Related genera are connected with lines having 2 arrows).

Tribe 2. Unoneae

The *Unoneae* were probably derived from the *Uvarieae* but from which genera and how, we can not say. They are a somewhat heterogeneous set with *Polyalthia* as the main central group from which various satellite genera arise. The petals are valvate and flat and usually expand when the flower is mature. *Polyalthia* is spread over a wide area and has many species so one might assume that it is a fairly old genus. It seems to be the most primitive and is the largest genus of the *Unoneae*. Its ovules are few or reduced to one. Besides this basic genus there is another branch which terminates with *Artabotrys* (ovules 2). Below *Artabotrys* on this branch comes *Cyathocalyx* (ovules many). In these two genera the petals are differentiated into blade and claw and there is often a constriction at the junction of the blade with the claw. The petals connive over the sexual organs giving them better protection.

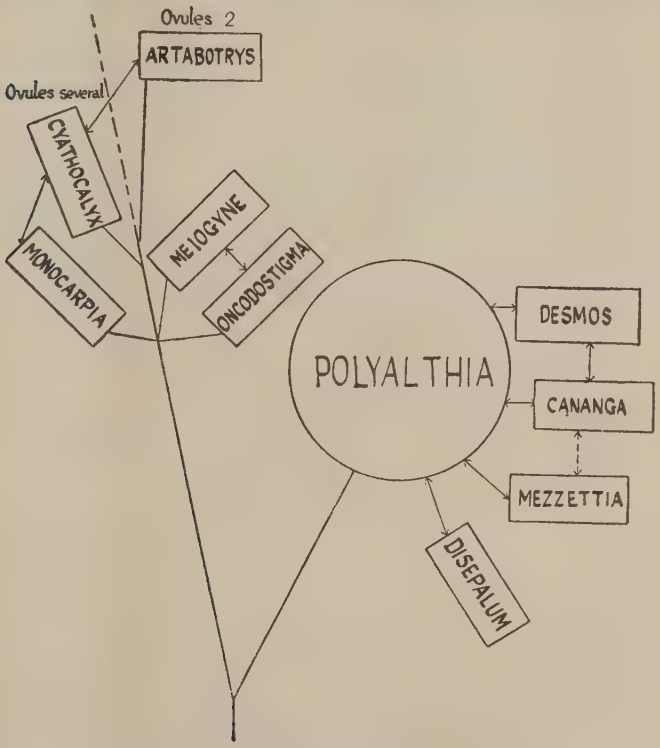


Fig. 2. Relationship in the tribe *Unoneae*.

Monocarpia, Meiogyne and *Oncodostigma* with petals not quite so well developed but aiming at this tendency, seem to be on this same branch and not on the *Polyalthia* side of the fork. It is conjecture whether this branch terminating in *Artabotrys* came directly from *Polyalthia* or not. I prefer to imagine that it came off at a lower level on the tree, not direct from *Polyalthia* but from a common stock. The diagram fig. 2 will show what may have happened.

Tribe 3. Xylopieae

An offshoot of the *Unoneae,* this small tribe is based mainly on petal characters. All the genera are to some extent related to each

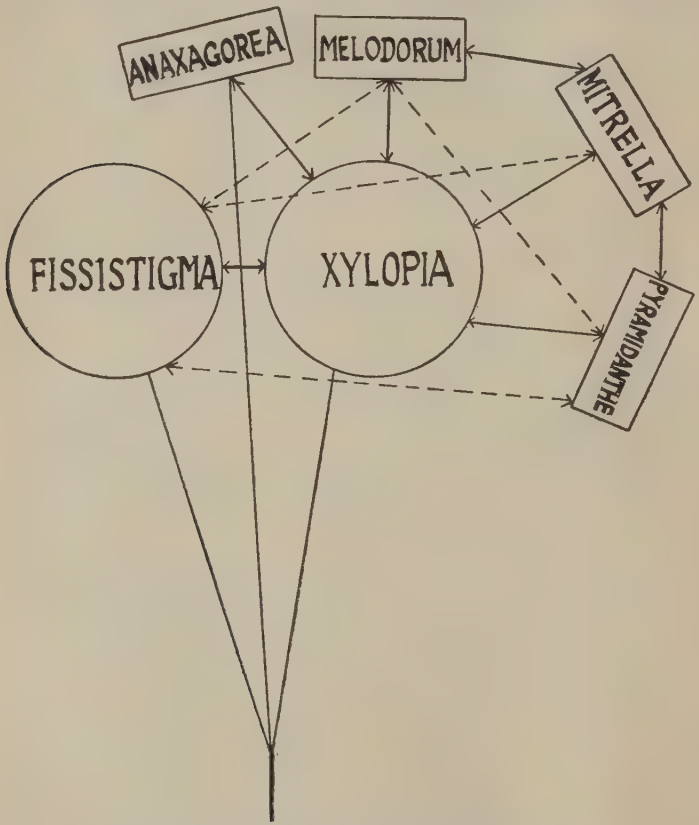
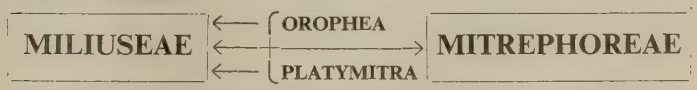


Fig. 3. Relationships in the tribe *Xylopieae.*
The dotted lines indicate less distant relationships.

other. *Fissistigma* and *Xylopia* are the two largest genera. *Melodorum, Mitrella* and *Pyramidanthe* seem to be more closely related to *Xylopia* than to *Fissistigma. Anaxagorea* with 2-seeded, dehiscent carpels may be the most advanced. It has some affinity with *Xylopia.* It is impossible to say whether the *Xylopieae* came from *Polyalthia* stock or from the *Cyathocalyx-Artabotrys* branch or from a root common to both. *Cyathocalyx* and *Artabotrys* like the *Xylopieae* have narrow elongated petals but so do several *Polyalthia* species.

Tribe 4. Miliuseae



A small tribe, probably an offshoot of the *Unoneae.* All the six Malayan genera are related to each other and they have in common one type of stamen although they are rather heterogeneous as far as their petals go. The stamens of *Marsypopetalum* and *Phaeanthus* are slightly different in that they have flat-topped connectives but it seems to be that the stamen is still *miliusoid* since the anther cells are not hidden by the connectives at least in the early stages (see systematic notes).

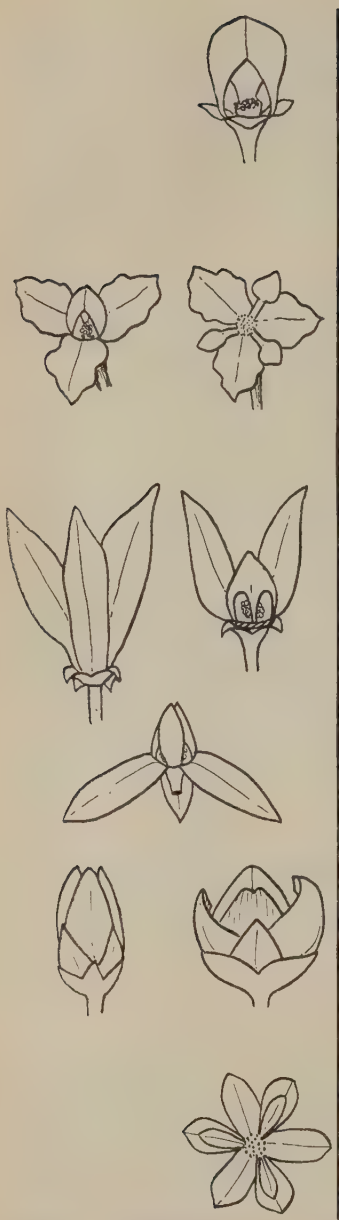
As already pointed out *Orophea* and *Platymitra* are links between the two tribes *Miliuseae* and *Mitrephoreae* but I have placed them in the former on account of the stamens. The stamen is probably a better character than the corolla on which to base relationship. Sexual organs are more stable and static and less liable to variation over a long period than the perianth. If the tribe *Miliuseae* is to be maintained we should look to the stamens rather than the petals.

SUMMARY OF PETAL CHARACTERS

Outer petals similar and equal to sepals	Both sets of petals equal and longer than sepals	Inner petals mitriform
Marsypopetalum	*Alphonsea* (both sets saccate)	*Orophea*
Phaeanthus		*Platymitra*
Miliusa (inner petals saccate)		

Tribe 5. Mitrephoreae

They probably came from the *Unoneae.* They are characterised by the development of a mitriform corolla. The diagram shows the development and differentiation of such a corolla. *Pseuduvaria* seems to be the most advanced where the inner petals are well differentiated into claw and blade and the blades remain united to form a dome.



PSEUDUVARIA

Outer petals slightly clawed or not. Inner larger, with very narrow claws, the blades united forming a dome.

MITREPHORA

Outer petals slightly or not clawed, spreading. Inner slightly shorter, with very narrow claws, erect, edges adhering, later free.

GONIOTHALAMUS

Outer petals slightly or not spreading. Inner, smaller, clawed, erect, connivent, edges adhering.

OXYMITRA

Outer petals spreading. Inner much smaller, not clawed, connivent, erect, their edges adhering.

POPOWIA

Outer petals spreading. Inner longer with incurved apices, and rudimentary claw, somewhat connivent and erect, united by edges at first, later free.

NEO-UVARIA

Petals subequal. Inner with a rudimentary claw, probably adhering by the thickened edges in the early stages only, soon spreading.

Fig. 4. Tribe *Mitrephoreae*. Tree based on development and differentiation of corolla.

Tribe 6. Annonineae

These have been mentioned in this account before. Hutchinson makes them a subtribe of the *Unoneae*. The carpels are united at least in fruit so there is an advance over the apocarpous type. The ovules are numerous in *Ararocarpus* but reduced to one in *Annona, Raimondia* and *Rollinia*. Note their counterpart in the *Uvarieae,* in the small group consisting of *Pachypodanthium, Annonidium* and *Fusaea* which also have united carpels.

Subfamily Monodoroideae

They are as previously stated the most advanced of all having the carpels united into a single ovary with parietal placentation. What was their origin? Was it from the *Unoneae* or from a separate common stock? No one can be sure.

Acknowledgements

I am indebted to the following institutions for the loan or inspection of herbarium material: Forest Research Institute Kepong, Malaya; Indian Botanic Garden, Sibpur, Calcutta; Forest Research Institute, Dehra Dun; Department of Agriculture, Siam; Sarawak Museum; Herbarium Bogoriense, Bogor, Indonesia; Royal Botanic Gardens, Kew; Royal Botanic Garden, Edinburgh.

SYSTEMATIC PART

The following abbreviations are used here:—

Mat. F.M.P. ..	Materials for a Flora of the Malayan Peninsula, by Sir George King.
F.M.P.	Flora of the Malay Peninsula, by H. N. Ridley.
S.F.N.	Singapore Field Number.
C.F.	Conservator of Forests. (The material from Forest Research Institute, Kepong now better designated as *Kep.*).
F.M.S. Mus. Herb.	Federated Malay States Museums Herbarium.
F.R.	Forest Reserve.
S.	Sungei (river).
G.	Gunong (mountain).

The letters S., C., D.D., K., E., and Kew placed after collector's numbers in brackets mean that I have personally seen herbarium sheets of the collector's number from the Singapore, Calcutta, Dehra Dun, Kepong, Edinburgh and Kew herbaria.

The measurements given for the length of the ovary except where otherwise stated include the length of the style and stigma as well since in many cases the style is wanting and the stigma is minute.

KEY TO THE GROUPS OF ANNONACEAE

a. Carpels free or if united forming a many-celled syncarp; stigmas erect — Subfamily (1) ANNONOIDEAE

b. Carpels free or if slightly so, then always quite free in fruit

c. Sepals imbricate or valvate. Petals 2-seriate, one or both series imbricate in bud. Stamens many, closely packed, their anther cells concealed at the top by the connectives. Indumentum of leaves often stellate or lepidote. Seeds many to few — Tribe (1) UVARIEAE

c. Sepals valvate. Petals all valvate either in two distinct series or rarely in one series, usually 6, rarely 4, more rarely 3, in the latter case either the inner or the outer series missing

d. Petals, both sets similar or sub-similar, equal or sub-equal, spreading in flower or the apices free, the outer flat or concave at the base only, the inner flat, terete or filiform, or concave or not at the base. Stamens many, connectives flat-topped or convex, rarely apiculate, the anther cells concealed by the connectives — Tribe (2) UNONEAE

d. Petals sub-equal or more often the inner shorter, the outer orbicular, ovate, oblong but usually lanceolate, spreading, often triquetrous, the inner nearly always triquetrous, not often spreading but remaining erect and touching each other, smaller than the outer. Stamen connectives slightly produced, the anther cells concealed by the connectives — Tribe (3) XYLOPIEAE

d. Petals, one or both sets but usually the inner saccate or at least broad at base, the outer small and like the sepals, free, the inner larger, free or less often tending to adhere to some extent by the margin (both sets sub-equal in *Alphonsea*). Stamens few, loosely imbricate, anther cells not concealed by the flat-topped, rounded or pointed connectives — Tribe (4) MILIUSEAE

d. Petals, inner larger or smaller than the outer, less often sub-equal, usually dissimilar, concave, connivent, arching over the sexual organs and forming a dome, if free their edges at first united for a short time, clawed, the claw often long and narrow or vestigial

or absent. Stamens many, flat-topped or convex, the connectives hiding the anther cells
Tribe (5) MITREPHOREAE

b. Carpels united into a fleshy mass, especially in fruit
Tribe (6) ANNONINEAE

a. Carpels united into a 1-celled ovary with parietal placentas, stigmas radiating

(No examples in Malaya)
Subfamily (2) MONODOROIDEAE

Tribe 1. UVARIEAE

Sepals imbricate or valvate. *Petals* 2-seriate, one or both series imbricate in bud. *Stamens* many, closely, packed, their anther cells concealed at the top by the connectives. *Indumentum* of leaves often stellate or lepidote. *Seeds* many to few.

KEY TO THE GENERA OF THE UVARIEAE

a. Sepals imbricate, trees or shrubs

b. Ovules numerous, 6 or more

c. Carpels several

d. Midrib on upper surface of leaf sunk; flowers axillary or in fascicles on woody tubercles from axils of fallen leaves; anthers sunk in connective tissue which is quadrate and truncate above; torus flat **1. Sageraea**

d. Midrib on upper surface of leaf raised, 1–2 mm. broad; flowers cauliflorous; anthers not embedded in the connective tissue; torus conical or hemispheric
2. Stelechocarpus

c. Carpels 1 **3. Kingstonia**

b. Ovules 1

e. Flowers hermaphrodite on pedicles over 5 mm. long, axillary or from axils of fallen leaves or on tubercles or short leafless twigs on the main trunk near the ground; style filiform or slender, stigma clavate
4. Enicosanthum

e. Flowers polygamous, extra axillary, sessile or on very short pedicles, never longer than 5 mm.; style very short, stigma sub-capitate **5. Trivalvaria**

a. Sepals valvate, climbers

f. Flowers extra-axillary, opposite the leaves or in pendulous clustered cymes from the older stems. Petals sub-equal; ovules more than one, ventral in two rows (1–2 in *Uvaria pauciflora*); style short or absent

g. Inner petals with a broad base

h. Petals usually large, 1–4 cm. long, flower opening wide when mature **6. Uvaria**

h. Petals small, usually not more than 8 mm. long, incurved at apex, not expanding very much in mature flower **7. Cyathostemma**

g. Inner petals with narrow claws **8. Rauwenhoffia**

f. Flowers in terminal panicles. Inner petals much smaller than outer; carpels 1-seeded with lateral apiculus, the seed attached slightly above the middle **9. Ellipeia**

1. SAGERAEA Dalzell in Hk. Kew Journ. Bot. 3 (1851) 207.

Trees with shining, coriaceous, glabrous leaves and slightly angled, glabrous twigs. *Flowers* small, globular in bud, expanding, axillary or fascicled on woody tubercles from the axils of fallen leaves, 1-2-sexual. *Sepals* orbicular to ovate, ciliate at margins, imbricate. *Petals* 6, imbricate in two series, sub-equal, concave, orbicular with ciliate margins. *Stamens* 6–21, imbricate in 2 or more series, the anther cells dorsal, oblong, surrounded by thick connective tissue which is produced laterally and is truncate and quadrate above. *Ovaries* 3–8. *Style* 0 or very short; stigma capitate. *Ovules* 6–8 in 2 rows. *Torus* flat. *Carpels* globose, thin-walled, nearly sessile or stalked.

TYPE OF GENUS: *S. laurifolia* (Grah.) Blatter in Journ. Bomb. Nat. Hist. Soc. 34 (1930) 294.

DISTRIBUTION: Indian Peninsula, Ceylon, Burma to Malay Archipelago and Philippines. Species about 9.

There are two species in Malaya but I have collected on Penang Hill a specimen of what appears to be a third:—*Sinclair S.F.N. 39035, 11th November, 1950*. This was a shrub 12 feet high with leaves only. The leaves are glabrous and oblong-oblanceolate in shape, widest above the middle, rounded at the apex and abruptly acute with an acute base. Flowers and fruit of this species are required.

KEY

a. Leaves oblong, 18–30 cm. long, 6·5–9 cm. broad with rounded base (1) **S. elliptica**

a. Leaves lanceolate, 16–18 cm. long, 4 cm. broad with acute base . . . . . (2) **S. lanceolata**

(1) **S. elliptica** (A. DC.) Hk. f. et Th. Fl. Ind. 1 (1855) 93; King Mat. F.M.P. Vol. 1 No. 4 (1892) 256 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 6 Pl. 34; Ridley, F.M.P. 1 (1922) 25; Craib, Fl. Siam. Enum. 1 (1925) 28.

Basonym: Uvaria elliptica A. DC. in Mém. Soc. Genève 5 (1832) 27; Wall. Cat. 6470 and 7421.

Synonyms: S. Hookeri Pierre, Fl. For. Cochinch. 1 (1879) T. 15. *Bocagea elliptica* Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 92; Kurz, For. Fl. Burma (1877) 50. *Diospyros* ? *frondosa* Wall. Cat. 4125 (nom. nud.).

Tree. *Twigs* glabrous, angled, striate, lenticellate with numerous leaf scars. *Leaves* coriaceous, glabrous, both surfaces shining, parchment-like in texture on the lower surface, oblong, bluntly acute, often obtuse when old; base rounded, slightly cordate and sometimes oblique with rigid, slightly recurved margins; midrib depressed above, prominent and raised beneath; main nerves 14–16 pairs, spreading and curved, faint, interarching near margin; secondary nerves very faint and reticulations invisible; medium brown when dry; length 18–39 cm., breadth 6·5–9 cm.; petiole 4 mm. long, very thick with faint rings. *Flowers* monoecious or hermaphrodite, solitary and axillary or fascicled on tubercles in the axils of fallen leaves, globular in bud, 1·5–1·8 cm. across when expanded, yellow. *Pedicels* pubescent, 7 mm. long with one median and several basal bracts. *Sepals* semi-orbicular, glabrous, tubercled, ciliate round the margins, 4 mm. long, 5 mm. broad. *Petals* tubercular outside, margins wavy and ciliate, 7 mm. long; the inner similar, slightly smaller and narrower. *Stamens* numerous, 1 mm. long and 1 mm. broad, with sub-quadrate, truncate connectives, the anther cells small, extrorse, embedded in the thick connective tissue. *Ovaries* 5–8, 2 mm. long, glabrous, nearly rectangular; style 0; stigma capitate and faintly emarginate; ovules about 8. *Ripe carpels* sub-sessile, globose, glabrous, thin-walled, 1·5–2·5 cm. in diam. *Torus* flat, not enlarged. *Seeds* 4–5 in 2 rows, crescent-shaped with one curved and two flat sides, brown, 1·3 cm. long.

KEDAH: 48th mile Jeniang Road, *Kiah S.F.N. 36168* (S., K., Kew).

PENANG: *Porter Wall. Cat. 7421* (C., Kew).

TRENGGANU: Ulu Brang, *Moysey* and *Kiah S.F.N. 33879* (S., K., Kew).

NEGRI SEMBILAN: Gunong Tampin, *Burkill S.F.N. 3239* (S.).

MALACCA: *Maingay 21* (C.); Bukit Tampin, *Goodenough 1903* (S., C.).
JOHORE: Muar at Biawak, *Curtis 3624* (S.).
DISTRIBUTION: Burma, Siam, Borneo.

In the Singapore Herbarium this species has been confused with *Goniothalamus tapis,* the leaves of which have a similar parchment-like texture but from which it is distinguished by the paler, angular twigs, the more coriaceous leaves and the larger, non-apiculate, several-seeded carpels. De Candolle and King state that the flowers are monoecious but in the Bornean material which I have examined they were found to be hermaphrodite.

(2) **S. lanceolata** Miq. in Ann. Mus. Bot. Ludg.-Bat. 2 (1865) 10; Ridley, F.M.P. 1 (1922) 25.

Tree. *Twigs* slender, striate, slightly angled. *Leaves* thin, coriaceous, shining, glabrous on both surfaces, lanceolate, shortly acute, narrowed to the base, margin slightly recurved, greenish above and medium brown beneath when dry, midrib and nerves as in *elliptica* but fewer in number, about 8 pairs; reticulations not visible; length 16–18 cm.; breadth about 4 cm.; petiole 4–5 mm. long. *Flowers* hermaphrodite, 5–7 mm. across, axillary, single, or in tufts. *Pedicels* up to 7 mm. long with one medial and several basal, pubescent bracts. *Sepals* and *petals* as in the preceding species but smaller, the respective lengths 1–1·5 mm. and 4 mm. *Stamens* about 20, very short, linear-oblong, glabrous. *Ovaries* 3, ovoid, scarcely longer than the stamens; ovules 10 in 2 rows. *Ripe carpels* globose, glabrous, sessile, dark brown when dry, 2 cm. long and 2 cm. broad. *Seeds* about 1·2 cm. long, flat with rounded ends, and reddish-brown testa.

PAHANG: Baloh, Kuantan, *Yeop C.F. 831* (S., K.).
DISTRIBUTION: Borneo.

A rare species, distinguished from the former by the smaller flowers and the smaller, lanceolate leaves with an acute base. No details of flower colour are available.

2. **STELECHOCARPUS** Hk. f. et Th., Fl. Ind. 1 (1855) 94.

Trees with coriaceous, shining leaves and midrib raised on upper surface. *Flower buds* globose. *Flowers* unisexual, fascicled on tubercles on the trunk or on the older branches, remote from the leaves. *Sepals* 3, elliptic to orbicular, imbricate. *Petals* 6 in 2 series, coriaceous, rounded, very concave, imbricate. *Stamens* in male flowers many in several series, the anthers occupying most of the stamen but not embedded in connective tissue, connectives flat-topped and slightly lobed. *Ovaries* numerous, style 0, stigma

orbicular with several minute lobes. *Ovules* 6–8 in 2 rows. *Torus* conical or hemispheric. *Ripe carpels* globose, sessile with 4–8 seeds in 2 rows.

TYPE OF GENUS: *S. Burahol* (Bl.) Hk. f. et Th. Fl. Ind. 1 (1885) 94.

SYNONYM: *Uvaria Burahol* Bl. Bijdr. 1 (1825) 14; Fl. Javae 1 (1830) 48 T. 23 and 25c.

DISTRIBUTION: Siam, Malaya, Malay Archipelago to New Guinea. Species 5.

A genus closely related to *Sageraea* in the structure of the flower but differing in the cauliflorous habit, the rather different stamens with anthers not embedded in connective tissue and the conical or hemispheric torus. The raised midrib on the upper surface of the leaf will at once separate it from *Sageraea*.

(1) **S. cauliflorus** (Scheff.) R.E. Fr. in Arkiv för Botanik, Band 3, nr 2 (3rd July, 1953) 42.

Basonym: Sageraea cauliflora Scheff. in Ann. Jard. Buitenz. 2 (1885) 5.

Synonyms: Stelechocarpus cauliflorus (Scheff.) J. Sinclair in Gard. Bull. Singapore 14 (August 1953) 43. *S. nitidus* King, Mat. F.M.P. Vol. 1 No. 4 (1892) 254 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 4 Pl. 2; Ridley, F.M.P. 1 (1922) 24. *S. Schefferi* Boerl. in Icon. Bog. 1 (1901) 199 T. 71. *Sageraea nitida* Finet et Gagnep. in Bull. Soc. Bot. France 53 Mém. 4 (1906) 59.

Tree 5–12 m. high with dark-coloured, slightly angled, glabrous twigs. *Leaves* coriaceous, somewhat bullate, oblong-lanceolate, acute, base acute, shining and glabrous on both surfaces, medium brown when dry with minute, dark, punctate scales on lower surface; main nerves 10–12 pairs, curved and interarching within the margin, boldly impressed on the upper surface as is the midrib and reticulations and still more prominent below; length 15–25 cm.; breadth 5–7 cm.; petiole 5–10 mm. long. *Flowers* dioecious, cauliflorous, globose in bud. *Pedicels* stout, broadening just below the calyx, puberulous with one amplexicaul, obtuse, sub-medial and two basal, pubescent bracts. *Sepals* coriaceous, connate at base, puberulous or glabrous with age, orbicular, minutely warted or rough, 5 mm. long and 8 mm. broad. *Petals* pale yellow, shortly obovate-orbicular, minutely warted or rough, 1–1·3 cm. long, the inner cucullate, glabrous and smaller. *Stamens* in male flowers many, in several series, 2·5 mm. long. *Ovaries* 3 mm. long, numerous, obscurely 3- angled, with adpressed hairs and sessile, orbicular, minutely lobed stigmas. *Torus* hemispheric. *Ripe carpels* broadly ovoid, obtuse, puberulous, dark brown, sessile, 4–5 cm. in diam. *Seeds* 4–6 in 2 rows, 3 cm. long and 1·5–2 cm. wide.

PENANG: Jungle behind Waterfall Gardens, *Sinclair, 8th November, 1950* (seen).

PERAK: Gunong Pondok, *King 7629* and *8224* (C.); *Henderson S.F.N. 23802* (S.).

PAHANG: Base of Gunong Senyum, *Henderson S.F.N. 22368* (S., K.); Tembeling, *Henderson S.F.N. 21859* (S., K., D.D.) and *Holttum S.F.N. 24707* (S., K.); Sungei Nering, Temerloh, *Henderson F.M.S. Herb. 10721* (S.).

SELANGOR: Bukit Hitam, *Ridley 7279* (S.).

DISTRIBUTION: Siam, Sumatra.

King No. 7183 in Herb. Calcutta collected in Perak and described by him as *Stelechocarpus punctatus,* consists of a leaf specimen with detached flowers. The leaves are those of *Pseuduvaria* sp. They are thin and cordate at the base and do not have the characteristic midrib of a *Stelechocarpus*. The flowers belong to *S. cauliflorus*.

Lobb's record of *S. Burahol* from Singapore is an error and this species has never been found there.

3. KINGSTONIA Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 93.

Monotypic genus. Tree. Pubescence of simple hairs. *Leaves* with rather erect, parallel nerves recalling those of *Enicosanthum*. *Flowers* fascicled in the axils of leaves or fallen leaves, hermaphrodite. *Sepals* persistent, imbricate. *Petals,* outer valvate?, inner imbricate. *Stamens* about 9 with flat-topped connectives and with filaments about same length as anthers. *Ovary* 1, strigose, angled; stigma peltate, minutely lobed or crenate. *Ovules* several in two rows. *Torus* hemispherical or conical. *Ripe carpel* one, sessile with thick pericarp.

TYPE OF GENUS: *Kingstonia nervosa* Hk. f. et Th.
DISTRIBUTION: Malay Peninsula, Java. Species 1.

(1) **K. nervosa** Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 93; King. Mat. F.M.P. Vol. 1 No. 4 (1892) 377 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 167 Pl. 216A; Ridley, F.M.P. 1 (1922) 100.

Tree 10–15 m. high. *Young twigs* dark brown, shortly pubescent, not stellate, later glabrous. *Young leaves* bright red, pubescent on midrib and veins, *mature leaves* sub-coriaceous, dark green except on the sunk midrib above, oblong or oblong- lanceolate, acute at apex with rounded base; nerves about 12 pairs, straight, nearly parallel, steeply ascending, impressed above, prominent beneath as is the midrib, line of interarching at margin indistinct; reticulations forming a fine meshwork, visible on both

surfaces; 15–21 cm. long and 5–9 cm. broad; petiole stout, 8 mm. –1·3 cm. long. *Flowers* several, fascicled in the axils of leaves or fallen leaves, with several imbricate, obtuse bracts at base of pedicel and a similar one immediately below calyx (both about 1 mm. long). *Pedicels* rusty-pubescent, about 8 mm. long. *Sepals* 3 mm. long, ovate, obtuse, pubescent outside, glabrous inside. *Petals* yellow, pubescent on both surfaces, obtuse, oblong-elliptic or slightly strap-shaped, thickened at middle, 1–1·1 cm. long and 2 mm. broad; inner very slightly smaller. *Stamens* 9, over 1 mm. long with flat-topped connectives; filament nearly as long as anther. *Ovary* 2 mm. long, angled, strigose with a peltate, slightly lobed or crenate stigma. *Torus* hemispheric or conical. *Ripe carpel* single, globose, much wrinkled in the dried specimens, sessile, wall hard, 5 mm. thick, 5–6·5 cm. long and 4 cm. broad. *Seeds* several in 2 rows.

PERAK: Upper Perak, *Wray 3376* (S., C., Kew); Kati, Kuala Kangsar, *Haniff S.F.N. 14946* (S.).

PAHANG: Kemansul Reserve, *Forest Guard, Forest Dept. 14083* (S.).

NEGRI SEMBILAN: Sungei Menyala, Port Dickson, *South* and *Sow Nos. 64773* and *64475* (K.).

MALACCA: *Maingay 22* (C., Kew) type material; Ayer Panas, *Goodenough 1329* (S., Kew).

No author has mentioned the imbricate sepals. The outer petals are stated to be valvate by Hooker fil. and Thomson but probably they may be slightly imbricate. The inner certainly are. The nearest ally seems to be *Stelechocarpus* as stated by Ridley and the imbricate sepals unnoticed by him are further grounds for this assumption. *Enicosanthum* is probably the second nearest. The leaves and the pubescent petals, slightly thickened at the middle and obtuse at the apex recall this genus.

4. ENICOSANTHUM Beccari in Nuov. Giorn. Bot. Ital. 3 (1871) 183.

Synonyms: Griffithia Maingay ex King in Ann. Roy. Bot. Gard. Calc. 4 (1893) 8 non Wight et Arn. *Griffithianthus* Merr. in Philipp. Journ. Sc. Bot. (1915) 231. *Marcuccia* Becc. in Nuov. Giorn. Bot. Ital. 3 (1871) 181; Airy-Shaw in Kew Bull. (1939) 276.

Shrubs or trees up to 16 m. high. *Leaves* glabrous or pubescent with prominent, rather straight, oblique, parallel nerves. *Flowers* bisexual, axillary or on the older branches from axils of fallen leaves or on tubercles or short leafless twigs on the main trunk near the ground. *Sepals* imbricate. *Petals* imbricate in two series,

thick, coriaceous, with numerous veins; the inner excavated at the base and having a thickened convex portion higher up on the inside and with a corresponding depression on the outside (best seen in fresh material). *Stamens* numerous, flattened, elongate, the connectives truncate, not produced; the anther cells long, linear, dorsal. *Ovaries* numerous; ovules solitary, basal; style filiform; stigma broadly clavate. *Ripe carpels* ovoid to oblong, rather thin-walled, stalked. *Seed* single, girdled longitudinally with a narrow groove, filling the carpel.

TYPE OF GENUS: *Enicosanthum paradoxum* Becc. in Nuov. Giorn. Bot. Ital. 3 (1871) 183 T. 5.

DISTRIBUTION: Ceylon, Burma, Siam, Malaya, Borneo and Philippines. Species about 16.

A number of species in the genus *Polyalthia* has recently been transferred here. The general appearance and in particular the seed recall *Polyalthia* but the flowers, with imbricate sepals, thick, pubescent, imbricate petals and uvarioid stamens indicate a place in the tribe *Uvarieae*. The genus contains about 16 species some of which are rather closely allied.

A specimen in Herb. Singapore collected by Corner on the 8th of November, 1935 from Bukit Kajang, Kemaman and labelled *Polyalthia* species is probably an undescribed species of *Enicosanthum*. The leaves are tomentose on the lower surface and the specimen is in fruit with large, oblong, stalked carpels. Flowering material of this is wanted before describing it as a new species.

KEY

a. Flowers in the axils of leaves or fallen leaves

b. Fl. pedicels 7 mm.–1 cm. long

c. Leaves glabrous or glabrescent beneath

d. Petals 5 cm. long; fruit with a curved beak (1) **E. magnoliiflorum**

d. Petals 2·5 cm. long; fruit not beaked (2) **E. cupulare**

c. Leaves usually pubescent beneath, occasionally glabrescent; petals 2·5 cm. long; fruit slightly apiculate (3) **E. fuscum**

b. Fl. pedicels 2·5–5 cm. long

e. Leaves thinly coriaceous, lateral nerves 20–24 pairs; sepals rigid, fleshy; petals 6 cm. long (4) **E. macranthum**

e. Leaves membranous, lateral nerves 13–15 pairs; sepals thin; petals 3·5 cm. long (5) **E. membranifolium**

a. Flowers on woody shoots on the trunk

f. Shoots 10–40 cm. long, simple or little branched; leaves pubescent beneath with an acumen 3–4 cm. long (6) **E. praestigiosum**

f. Shoots 3–4 cm. long, cymosely branched; leaves glabrous beneath, not acuminate (7) **E. congregatum**

(1) **E. magnoliiflorum** (Hk. f. et Th.) Airy-Shaw in Kew Bull. (1939) 277.

Basonym: Polyalthia magnoliaeflora Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 64; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 303.

Synonyms: Griffithia magnoliaepetala Maing. ex King in Ann. Roy. Bot. Gard. Calc. 4 (1893) 9 Pl. 218; Ridley, F.M.P. 1 (1922) 26. *Griffithianthus magnoliiflorus* (Hk. f. et Th.) Merr. in Philipp. Journ. Sc. Bot. (1915) 231; Craib, Fl. Siam. Enum. 1 (1925) 29.

Tree 10–17 m. high. *Young twigs* striate, rusty-tomentose. *Leaves* thinly coriaceous, obovate-oblong, apex acute or shortly acuminate, the base rather broad, rounded or minutely cordate, the upper surface glabrous except on the midrib and nerves, the under surface at first pubescent, ultimately glabrous; nerves 15–20 pairs, oblique, rather straight, parallel, raised on lower surface as is the midrib; reticulations distinct below, nearly parallel, between the nerves and at right angles to them; length 20–30 cm.; breadth 6–12 cm.; petiole tomentose, 7 mm. long. *Flowers* large, white, scented like a *Magnolia,* solitary, axillary, on a short, pubescent. 7 mm. long pedicel with one medial and two basal, pubescent, amplexicaul bracts. *Sepals* 8–10 mm. long and about 1·5 cm. broad, coriaceous, imbricate, warted and tomentose outside, glabrous inside, broadly ovate, spreading with an acute tip. *Petals* subequal, coriaceous, imbricate, oval or ovate-lanceolate, sub-acute, tomentose, minutely warted, with several indistinct veins, length about 5 cm. when mature, breadth of outer about 1·5 cm. and of inner 1 cm. *Stamens* with truncate connectives. *Ovaries* tomentose with filiform styles. *Torus* conical. *Ripe carpels* 4 cm. long, shortly stalked, oblong, tapering at each end, pubescent, the apex mucronate. *Seed* grooved longitudinally, shining.

Perak: *King 10965* (C., Kew).
Pahang: Rotan Tunggal, Raub, *Kalong 20316* (S.).

SELANGOR: Ginting Simpah, *Hume F.M.S. Mus. Herb. 9289* (S.); *Strugnell 13004* (S.) and *13384* (S.).
MALACCA: *Maingay 93* (C., Kew) type.
DISTRIBUTION: Siam?

A rare species, near to *E. macranthum* but distinguished from it in flower by the very short pedicels and the acute apex of the sepals. In *macranthum* the pedicels are 4–5 cm. long and the sepals rounded at the apex. The leaves of the two species are very similar. Large leaved specimens of *fuscum* especially if they are nearly glabrous also come near to *magnoliiflorum* and may be confused with it but the fully developed flowers of the latter are larger and the fruit has a hooked beak and not a slightly apiculate one. I have seen one sheet of *Kerr's 7668, E. magnoliiflorum* from Siam. It has flowers on woody tubercles and is more likely to be *E. congregatum* but from the scanty material it is not possible to be quite sure.

(2) **E. cupulare** (King) Airy-Shaw in Kew Bull. (1939) 277.

Basonym: Griffithia cupularis King in Ann. Roy. Bot. Gard. Calc. 4 (1893) 9 Pl. 219; Ridley, F.M.P. 1 (1922) 26.

Synonym: Griffithianthus cupularis (King) Merr. in Philipp. Journ. Sc. Bot. (1915) 231.

Shrub or tree up to 17 m. high. *Young twigs* rusty-tomentose and with well-marked striations. *Leaves* membranous, oblong or obovate, shortly acuminate, narrowed below the middle to the slightly rounded, sometimes sub-oblique base; upper surface shining, glabrous except the slender sunk midrib; lower surface paler, glabrous except on the midrib and the 12–16 pairs of oblique, parallel, slender, pubescent nerves; lines of interarching of the nerves faint, often obscure and 1 mm. from margin; reticulations faint; length 15–23 cm. (average about 15 cm.) breadth 5–7·5 cm.; petiole 5–7 mm. long, pubescent. *Flowers* solitary, axillary, sub-globose in bud, fragrant with the odour of *Cananga,* the petals lengthening considerably as flower matures. *Pedicels* tawny-pubescent, about 1 cm. long, thickened at point of attachment of bracteole at base of flower and having two other sub-orbicular, sheathing bracteoles, near the base. *Sepals* imbricate, ovate-orbicular, slightly warted and softly tawny-tomentose outside, glabrous inside, apex acute, length 8 mm., breadth 1·2 cm. *Petals* imbricate, adpressed-silky-tomentose on both sides except a glabrous patch inside at the base, cream-coloured, later a tawny grey; outer broadly ovate, obtuse, about 2·5 cm. long; inner shorter and thicker. *Stamens* numerous, outer compressed, the filaments very short, the connectives truncate and not produced

above the linear dorsal anthers, length 3–3·5 mm. *Ovaries* about 12, oblong, adpressed-pubescent with 1–2 basal ovules; style slender, shorter than ovary with clavate stigma. *Ripe carpels* ovoid or sub-globose, blunt at each end, tawny-tomentose, thin-walled, 2 cm. long; stalks 7 mm. long. *Seed* single with longitudinal groove.

PERAK: *King 3856* (C.) type material; *5514* (C., Kew) type material; *7630* (C., Kew) type material; Larut, *King 6643* (S., C., E., Kew) type material.

TRENGGANU: Bukit Kajang, Kemaman, *Corner S.F.N. 30337* (S.); *S.F.N. 30343* (S.).

DISTRIBUTION: Endemic.

Very near *E. fuscum*. After much deliberation I have refrained from uniting them. In *fuscum* the leaves are thicker with stouter veins and a broader, rounded base. They are usually more pubescent beneath but the degree of pubescence is variable. The petals are more ovate and obtuse in *cupulare*, see King l.c. Pl. 219 but I have not seen fully expanded flowers.

(3) **E. fuscum** (King) Airy-Shaw in Kew Bull. (1939) 277.

Basonym: Griffithia fusca King in Ann. Roy. Bot. Gard. Calc. 4 (1893) 10 Pl. 220; Ridley, F.M.P. 1 (1922) 26.

Synonym: Griffithianthus fuscus (King) Merr. in Phillipp. J.Sc. (1915) 231.

Tree 7–20 m. high. *Young twigs* rusty-tomentose, striate. *Leaves* thinly coriaceous, oblong to oblong-lanceolate, shortly acuminate, the base rounded, upper surface glabrous except the pubescent midrib, lower softly pubescent, varying in degree of pubescence or becoming glabrescent; nerves 12–16 pairs as in the preceeding species but stouter, interarching near the margin in a similar fashion; length 15–20 cm.; breadth 4·5–6·5 cm.; petiole 5–6 mm. long, stout, tomentose. *Flowers* solitary, axillary, the buds globular at first but elongating with age. *Sepals* as in the preceding species. *Petals* cream-coloured, ovate-oblong, other details as in the preceding but sub-acute and longer, length 3·5 cm., the inner slightly shorter and narrower. *Stamens* and *ovaries* as in the preceding. *Ripe carpels* ovoid, slightly apiculate, densely and minutely rusty-tomentose, 1 cm. long or longer.

PERAK: Ulu Bubong, *King 10110* (C.) type material; *10039* (C.); *10404* (C., Kew) type material; *10130* (S., C., E., Kew) type material; Gunong Bubu, *King 8346* (C.) type material; Gopeng, *King 6027* (C.); Tapah, *Wray 1432* (S., C.) type material.

PAHANG: Baloh Forest Reserve, Compt. 1, *Md. Arif 17248* (K.); Bukit Goh Forest Reserve, Compt. 2, block 25, *Mahmud 17241* (K.); Bukit Kajang Forest Reserve, Raub, *Mahamud 20409* (K.); Tembeling, *Henderson S.F.N. 21883* (S., K., Kew); Tasek Bera, *Henderson S.F.N. 24064* (S., K.).

SELANGOR: Kanching Reserve, *Ahmad 6363* (K.); Weld Hill Reserve, *Ahmat C.F. 2498* (S.); *Hamid C.F. 601* (S., Kew); *Symington 43630* (K.); *Woolley 10333* (S., E.).

DISTRIBUTION: Endemic.

See notes under preceding species.

(4) **E. macranthum** (King) J. Sinclair, **comb. nov.**

Basonym: Polyalthia macrantha King, Mat. F.M.P. Vol. 1 No. 4 (1892) 303 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 68 Pl. 93; Ridley, F.M.P. 1 (1922) 58.

Synonym: Enicosanthum nitidum Airy-Shaw in Kew Bull. (1939) 278 as to Malayan specimens only.

Tree 3–23 m. high with slender branches. *Leaves* thinly coriaceous, oblong to elliptic-oblong, acute, rather similar to those of the preceding but somewhat narrower and longer proportionately and not so wide at the middle, base rounded or minutely cordate, both surfaces glabrous except the depressed midrib above; main nerves about 20–24 pairs, oblique, parallel, slightly depressed above and raised below; length 30–45 cm.; breadth 11·5–19 cm.; petiole 1 cm. long, stout. *Flowers* scented, solitary, axillary, on glabrous 4–5 cm. long pedicels with a sub-orbicular bracteole about the middle. *Sepals* thick, sub-orbicular, very obtuse, warted and pubescent outside, glabrous inside, 1 cm. long and 1·5 cm. broad. *Petals* whitish, thick and fleshy, similar to those of *congregatum,* oblong-elliptic, acute, pubescent except at the base, with several fine nerves; length about 6 cm.; breadth 2–2·5 cm. *Stamens* numerous, compressed, 4–5 mm. long with truncate connectives. *Ovaries* oblong, puberulous with slender styles and capitate-truncate stigmas. *Ripe carpels* 2·5–3 cm. long and 2 cm. in diam., elliptic-ovoid, sometimes oblique, glabrous, the apex beaked, at least in the younger carpels. *Seed* ovoid, solitary, filling the carpel.

PERAK: Larut, *King 6654* (C., D.D.) type material, and *2199* (C., Kew) type material; *Scortechini 2048* (C.) type material; Relau Tujor, *Wray 2982* (S., C.).

DISTRIBUTION: Endemic. Rare.

The leaves of *magnoliiflorum, congregatum* and *macranthum* are very similar and in a sterile condition there will be difficulty in distinguishing them. *E. macranthum* has somewhat proportionately narrower leaves which are not so wide at the middle. The long axillary pedicel, the obtuse sepals and glabrous ripe carpels will at once separate it from the other two species.

In the treatment of this species I follow King, Ann. Roy. Bot. Gard. Calc. 4 (1893) 83 who, after studying the type of *Guatteria nitida* A. DC. (1832), *Wallich 6439* Tavoy (*Polyalthia nitida*

Bth. et Hk. f. (1872) in the Delessert Herbarium (*leaf twig and detached fruit*) and its duplicates in Kew (*leaf twig and attached fruit*) and Calcutta (*leaf twig with flowers*), came to the conclusion that *G. nitida* was a dubious species; its flower found in the Calc. Herb. did not agree with Lobb's specimen cited and described by Hooker f. and Thomson under *P. nitida*. Now Airy-Shaw, Kew Bull. (1939) 278 who considered *P. nitida* and *P. macrantha* as identical has not offered any reasons for making this decision and for rejecting King's opinion. Apparently Airy-Shaw has identified *P. nitida* on Lobb's specimen only as is obvious from the distribution he gives for the species. He quotes Burma doubtfully whereas had *P. nitida* been identified on its type, Burma should have been the type locality. I have seen *Wallich 6439* at Kew and it is certainly not King's *P. macrantha,* nor is it identical with Lobb's specimen. I do not think either that Lobb's specimen is the same as King's *macrantha*. It more closely resembles my *E. membranifolium* and may be the same. Hence I exclude *P. nitida* based on Tavoy specimens from *Enicosanthum* and make the new combination to cover the Malay Peninsula specimens only.

(5) **E. membranifolium** J. Sinclair, **sp. nov.**

Inter species cum floribus in axillis foliorum (delapsorum vel non) orientibus, pedicellis 2·5–4 cm. longis, sepalis tenuibus, foliis membranaceis glabris cum nervis primariis 13–15 jugatis distinguitur.

Arbor 9–12 m. alta. *Ramuli novelli* minute pubescentes mox glabri, striati nigricantes. *Folia* 16–25 cm. longa, 4·5–9 cm. lata, membranacea, oblonga vel elliptica, utrinque nitidiuscula, glabra, apice acuta, basi cuneata vel leviter rotundata; nervi 13-15-jugati in pagina inferiore pallidi, prominentes curvati adscendentes aliquando indistincte anastomosantes; costa supra immersa, subtus elevata interdum basi duobus sulcis parvis striata, reticulationibus tenuibus; petioli glabri numerosis annulis praediti, 5 mm. longi. *Flores* 1–3 virido-flavidi in axillis foliorum delapsorum orti. *Pedicelli* 2·5–4 cm. longi pubescentes, bracteolam pubescentem amplexicaulem infra medium ferentes. *Sepala* imbricata late triangularia tenuia acuta vel obtusiuscula, extus tomentosa, intus glabra 8–10 mm. longa. *Petala* (basi intus glabra excepta) tomentosa; exteriora oblonga obtusa vel acuta basi lata, multinervata, 3·5 cm. longa, 1·5 cm. lata; interiora paulo minora et angustiora, basi intus excavata ad medium intus tumida vel geniculata. *Stamina* numerosa, 2·5–3 mm. longa, connectivis truncatis. *Ovaria* pubescentia infra stigmatem constricta, 3 mm. longa. *Torus* convexus pubescens crassus. *Carpella matura* 2–3 cm. longa, ovoidea, pericarpio

tenui, breviter deciduo-tomentosa, in sicco saepe rugosa; stipites sulcati 2 cm. longi. *Semen* solitarium pallidum nitidum canaliculo longitudinali cinctum.

LOWER SIAM: Ban Son, *Haniff* and *Nur. S.F.N. 4232* (S., K.).

KEDAH: Telok Apau, Langkawi, *Haniff* and *Nur S.F.N. 7096* (S., Kew).

KELANTAN: Gua Panjang at Gua Ninik, *Henderson S.F.N. 19522,* holotype (S., K., Kew); Bukit Rekeh, *Walton 32826* (K.).

PENANG: Waterfall, *Curtis 2277* (S., C., Kew); *Haron, 22nd December, 1905* (S.); Waterfall Valley, *Nur. S.F.N. 1243* (S.).

SELANGOR: Sungei Lalang Forest Reserve, Kajang, *Symington 22658* (K., Kew).

DISTRIBUTION: Malay Peninsula.

The leaves of this species are thinner than in the other members of the genus and quite glabrous while the flowers are less fleshy. King had seen this species but did not take it up owing to lack of material. This species is very near to *E. merguiensis* (Chatterjee) J. Sinclair in Gard. Bull. Singapore 14 (1953) 45 [*Uvaria merguiensis* Chatterjee] and may be the same but I have seen only one sheet, *Po Khant 11394,* Mergui, a duplicate of the type. The leaves on this sheet are more rounded at the base and the sepals are longer.

(6) **E. praestigiosum** J. Sinclair, **sp. nov.**

Inter species caulifloras ponenda, sed surculis floriferis longioribus, foliis subito acuminatissimis distinguenda. *E. erianthoideo* Airy-Shaw et *E. congregato* (King) Airy-Shaw haec species nonnihil similis, a priore floribus majoribus ab ultimo foliis pubescentibus dissimilis.

Arbor 15 m. alta. *Ramuli novelli* pallido-fusco-tomentosi striati. *Folia* 22–38 cm. longa, 7·5–14 cm. lata, tenuiter coriacea, oblongo-obovata, in acumine 3–4 cm. longo cuspidata, basi rotundata vel cuneata; supra glabra praeter nervos et costam depressam, non nitida; subtus pallido-fusca, costa nervisque reticulationibusque prominentibus pubescentibus; nervi primarii 16-18-jugati, obliqui fere paralleli in marginali nervo interrupto indistincte anastomosantes; petioli 1–1·5 cm. longi crassi tomentosi. *Flores* omnino fusco-tomentosi lacteo-flavidi vel albescentes, in surculis lignosis caulifloris 10–40 cm. longis, fere 10–15 cm. supra solum orientes. *Pedicelli* rigidi, pallido-fusco-tomentosi, 2·5–3 cm. longi. *Bractea* unica, late ovata, alabastrum juvenile tegens, supra glabra, subtus tomentosa, prope basin calycis sita. *Sepala* imbricata triangularia acuta, obscure 5-nervata, 2·5–3 cm. longa, 2–2·5 cm. lata. *Petala* imbricata subaequalia crassa coriacea, obscure plurinervata; exteriora oblongo-elliptica, basi intus leviter excavata, 8

Fig. 5. *Enicosanthum praestigiosum* J. Sinclair.

A, Leaf. B, Flowering twig. C, Outer petal. D, Inner petal. E, Stamen, front view. F, Stamen, back view. G, Gynoecium. H, Sepals and young carpels. I, Twig bearing carpels. J, Single carpel. K, Cross section of carpel. L, Seed with part of carpel attached.

cm. longa, 4 cm. lata; interiora angustiora, paullo infra medium leviter constricta, basi intus excavata, ad medium intus gibbosa extus concavo-foveata. *Stamina* 5 mm. longa, interiora connectivis truncatis, exteriora obliquis praedita. *Ovaria* numerosa 5–6 mm. longa, stigmatibus clavatis glabris. *Carpella matura* obtusa tomentosa, 6 cm. longa, 3 cm. lata; stipites 5–10 mm. longi. *Semen* solitarium nitidum, canale levi longitudinaliter praeditum. **Fig. 5.**

JOHORE: Sungei Kayu, *Kiah S.F.N. 32017*, holotype (S.); *Corner S.F.N. 32237 and 32765* (S.); Mawai-Jemaluang Road 14½ mile, *Corner S.F.N. 28449* (S., Kew); Mersing Road, *Holttum S.F.N. 36393* (S.).

DISTRIBUTION: Endemic.

A rare species of the fresh water swamp forest, with large creamy white petals.

(7) **E. congregatum** (King) Airy-Shaw in Kew Bull. (1939) 277.

Basonym: Polyalthia congregata King, Mat. F.M.P. Vol. 1 No. 4 (1892) 310 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 76 Pl. 107; Ridley, F.M.P. 1 (1922) 60.

Tree 13–20 m. high with spreading branches. *Young twigs* rusty-tomentose and striate, soon becoming glabrous and dark coloured. *Leaves* thinly coriaceous, shining green, oblong-elliptic, slightly obovate, broadest near the middle, bluntly acute or obtuse when old, slightly narrowed to the rounded or minutely cordate base, glabrous above except on the depressed midrib, glabrous below; nerves about 23 pairs, slender above but distinct, prominent below as is the midrib, oblique, slightly curved; length 30–40 cm.; breadth 12–18 cm.; petiole 7–9 mm. long, stout. *Flowers* large, on woody 3–4 cm. long cymes from the trunk near its base. *Pedicels* 3–4·5 cm. long, glabrescent with a single, sub-orbicular, clasping bracteole below the middle. *Sepals* thick, ovate-triangular, spreading, warted outside, glabrous inside, often reflexed, 7 mm. long. *Petals* thick, white, ovate-elliptic, subacute, hoary-puberulous, except at the base inside, outer 4–7·5 cm. long and 1·5–2·5 cm. broad, the inner narrower. *Stamens* numerous, 3–4 mm. long, the connectives truncate, oblique, granular. *Ovaries* numerous, oblong, strigose, with a basal ovule and oblong pubescent stigma. *Ripe carpels* about 2·5 cm. long, elliptic, beaked, hoary-pubescent, narrowed at the base into the thick, short stalk. *Seed* pale brown, grooved, filling the carpel.

PERAK: Gopeng, Kinta, *King 4831* (S., C., D.D., Kew) type material; Larut, *King 7613* (C., Kew) type material; *Scortechini 1926* (C.) type material.

SELANGOR: Bukit Lagong Reserve, Kepong, *Pawanche 14667* (S., K.); Gua Batu, *Ridley, 24th June, 1889* and *December 1896* (S.).

DISTRIBUTION: Endemic.

Rare, Distinguished from *macrantha* by the cymose inflorescence on woody tubercles on the trunk, and the puberulous fruit.

5. TRIVALVARIA Miq. in Ann. Mus. Bot. Lugd.-Bat. 2 (1865) 19.

Shrubs or small trees. *Nerves* of leaf decurrent on upper surface where they join the midrib. Upper midrib slightly verrucose. *Flowers* polygamous, extra-axillary, sessile or on very short pedicels. *Sepals* imbricate. *Petals* imbricate or slightly imbricate, tomentose; outer shorter than inner; both sets spreading or inner set erect and adhering by edges, inner shortly clawed. *Stamens* numerous with convex connectives. *Ovaries* elongate, angled; style very short, stigma sub-capitate. *Ripe carpels* thin-walled. *Seed* 1, large with a circumferential, longitudinal groove.

TYPE OF GENUS: *T. macrophylla* (Bl.) Miq. in Ann. Mus. Lugd.-Bat. 2 (1865) 19.

DISTRIBUTION: Burma, Siam, Malaya, Java, Borneo and Sumatra. Species five not including *T. Stymannii* Scheff. and *T. carnosa* Scheff. which are probably only varieties of *T. macrophylla.*

Ridley has wrongly placed the species of this genus in *Popowia.* King also wrongly assigned one of the species to *Popowia* and two to *Ellipeia.* The sepals are imbricate, very markedly so in *T. macrophylla* but less noticeable in the others. The petals also are imbricate or slightly so. In *T. macrophylla* they appear to be imbricate in the very young stages only. From the arrangement of the sepals and petals the systematic position of *Trivalvaria* must be near *Enicosanthum.* This is further borne out by the carpels and the large single seed with the longitudinal circumferential groove. Both are similar to those of *Enicosanthum.*

KEY

Flowers and fruits

a. Inner petals thick, erect, adhering by edges at top, longer than outer (outer = 7–8 mm. long and inner = 1–1·3 cm.); carpel stalks 3 mm. long (1) **T. macrophylla**

a. Inner petals thin, spreading, only slightly longer than outer (outer = 8 mm. long and inner = 9 mm.); carpel stalks 2–2·5 cm. long (2) **T. nervosa**

a. Inner petals thin, spreading, slightly longer than outer (outer = 5 mm. long and inner = 8 mm.); carpel stalks 4–5 mm. long (3) **T. pumila**

Leaves only (sterile)

a. Upper surface dull when dry

b. Reticulations very faint or not visible, meshes close (1) **T. macrophylla**

b. Reticulations distinct, meshes very close (3) **T. pumila**

a. Upper surface shining when dry

b. Reticulations distinct, raised on both surfaces, meshes very open (2) **T. nervosa**

(1) **T. macrophylla** (Bl.) Miq. in Ann. Mus. Bot. Lugd.-Bat. 2 (1865) 19; Boerl. in Icon. Bog. 1 fasc. 2 (1899) 143 Tab. 48 figs. 1–18.

Basonym: Guatteria macrophylla Bl. Bijdr. (1825) 19 et Fl. Jav. Anon. 1 (1830) 96 Tab. 47.

Synonyms: G. brevipetala Miq. Fl. Ind. Bat. Suppl. (1861) 381. *G. imbricata* Bl. Fl. Jav. Anon. (1830) 94. *Popowia nervifolia* Maingay ex Hk. f. Fl. Br. Ind. 1 (1872) 69; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 344 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 121 Pl. 164; Ridley, F.M.P. 1 (1922) 77. *Goniothalamus imbricatus* (Bl.) Koorders in Exkursions Fl. Java 2 (1912) 252 in clavi. *G. costulatus* Miq. Fl. Ind. Bat. Suppl. (1861) 372.

Tree 3–13 m. high. *Young twigs* rusty-tomentose, later dark coloured, glabrous and striate. *Leaves* coriaceous, oblong-lanceolate, oblanceolate or elliptic-oblong, apex shortly acuminate, base acute, upper surface shining, glabrous, lower sparsely rusty-pubescent, becoming glabrous with age; nerves 10–13 pairs, oblique, straight, thin and slightly raised above, decurrent to the midrib, prominent beneath, running out to the edge, not or scarcely interarching; reticulations scalariform, very oblique, faint or not visible; length 16–22 cm.; breadth 4·5–8 cm.; petiole 8 mm.–1·2 cm. long, rusty-pubescent. *Flowers* extra-axillary, polygamous, 1–3 in groups, sessile, with several tomentose bracts. *Sepals* imbricate, broadly ovate-triangular to suborbicular, acute, slightly smaller than the outer petals, softly whitish-yellow, tomentose outside and glabrous inside as are the petals, 5 mm. long. *Petals* coriaceous slightly imbricate in the bud; outer 7–8 mm. long, broadly ovate, acute; inner 1–1·3 cm. long, rhomboid, concave inside, not appearing to open or remaining closed for a long time (dried material), base with a short, narrow, incurved claw. *Stamens* 2 mm. long with convex connectives. *Ovaries* 2.5 mm. long, elongate, angled, strigose, style very short, stigma sub-capitate, pubescent. *Ripe carpels* numerous, cylindric-ovoid, apiculate, narrowed to the stalk, thin-walled, thinly pubescent, 1·5–2 cm. long and 1 cm. in diam.; stalks strigose, 3 mm. long. *Seed* 1, pale with a longitudinal circumferential groove.

KEDAH: Koh Mai F.R., *Kiah S.F.N. 35170* (S., K., Kew); Baling. Kiah *S.F.N. 35393* (S., K., Kew).

KELANTAN: Bukit Batu Papan, S. Lebir, *Henderson S.F.N. 29520* (S., Kew); S. Merah, *Sow 46021* (K.).

PENANG: Pass to Telok Kumbar, *Curtis 893* (S., Kew); Pulau Boetong, *Curtis 2140* (S.); Moniot Road, East, *Sinclair S.F.N. 39350* (S.).

PERAK: Gopeng, *King 5943* (S., C., Kew); *5889* (S., C., D.D., E.); Larut, *King 7498* (C., Kew); *4297* (C.); Upper Perak, *Wray 3472* (S., C.); Dengong to Kampar Road, *Haniff S.F.N. 14317* (S., K., Kew).

PAHANG: Temerloh, *Ridley*, 12th July, 1891 (S.); Tanjong Antan. *Ridley 2427* (S., C.); 8 mls. south of Kuala Lipis, *Burkill* and *Haniff S.F.N. 17062* (S., K.); Ayer Surin, Pulau Tioman, *Henderson S.F.N. 21721* (S., K.); Joara Bay, Pulau Tioman, *Burkill S.F.N. 1015* (S., C., Kew).

SELANGOR: Batu Caves, *Symington 30781* (K.); *Burkill S.F.N. 6342* (S., Kew); *Ridley 8246* (S.); Kuala Lumpur, *Curtis, February 1890* (S.); Klang Gates, *Hume F.M.S. Mus. Herb. 7070* (S.); Gua Batu, *Ridley 8628* (S.).

MALACCA: *Maingay 53* (C., Kew) type of *Popowia nervifolia; Alvins 2273* and *2277* (S.).

SINGAPORE: Ridley, no exact locality or date. No recent collections.

DISTRIBUTION: Java, Borneo, Sumatra.

The sepals are distinctly imbricate and overlap more than they do in *T. nervosa.*

(2) **T. nervosa** (Hk. f. et Th.) J. Sinclair, **comb. nov.**

Basonym: Ellipeia nervosa Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 52; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 276 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 35 Pl. 33.

Synonym: Popowia nervosa Ridl. F.M.P. 1 (1922) 78.

Tree up to 13 m. high. *Young twigs* slightly puberulous, soon glabrous, dark coloured and striate. *Leaves* coriaceous, shining, elliptic-oblong or oblong-lanceolate, apex acute, base acute, glabrous and dark green above, beneath sparsely strigose or glabrous and paler green; nerves 10–16 pairs, oblique, rather straight, slender and raised above, very prominent below; reticulations distinct and raised on both surfaces, scalariform, nearly horizontal; length 18–33 cm.; breadth 5–10 cm.; petiole 1–1·3 cm. long. *Flowers* polygamous, solitary, extra-axillary. *Pedicels* 3–4 mm. long, rusty-pubescent, with about 3 minute, amplexicaul, acute bracts. *Sepals* broadly ovate, acute, imbricate at the very base, whitish-yellow, strigose outside, glabrous inside, 2–3 mm. long. *Petals* imbricate, white, tomentose, puberulous at the base inside, thin, obtuse, the outer 8 mm. long, broadly ovate-oblong, the inner about 9 mm. long, narrower with a very short claw. *Stamens* 2 mm. long with convex connectives. *Ovaries* numerous, curved (not seen by me). *Ripe carpels* obtuse at both ends, wine-red, changing

to black when ripe, glabrous, thin-walled, 2–2·5 cm. long and 1·3–1·5 cm. in diam.; stalks 2–2·5 cm. long, wine-red. *Seed* 1, with a circumferential longitudinal groove, filling the carpel.

KEDAH: Hulu Bakai Reserve, *Boswell 12591* (K.).

KELANTAN: Chaning Woods, *Ridley, February 1917* (S., Kew); *Scortechini 494* (C., D.D.).

PERAK: Blanda Mabok, Larut, *Wray 3948* (S., C., Kew); Larut, *King 5302* (C., D.D., E., Kew); Waterloo, *Curtis 1278* (S., Kew).

PAHANG: Bukit Goh, Kuantan, *Yeop C.F. 3151* (S., K.); Belengo F.R., Mentakab, *Henderson F.M.S. Mus. Herb. 10770.* (S.).

MALACCA: *Maingay 47* (C., Kew) type material; *Alvins 737* (S.); Sungei Udang, *Alvins 12* (S.).

JOHORE: Bukit Tinjau Laut, *Ngadiman, 3rd August, 1939* (S.) and *Corner S.F.N. 37070* (S., K.); 14th mile Mawai-Jemaluang Road, *Corner S.F.N. 29032* (S., C., K., Kew); Gunong Panti, *Ridley, December 1892* (S.).

DISTRIBUTION: Not known outside Malaya.

The midrib on the upper surface of the leaf of this species is broader at the base than in *T. macrophylla* and the punctate or verrucose markings as well as the reticulations are more distinct when dry. The leaves also are more glossy and often glabrous beneath. The petals spread while the inner in *T. nervifolia* appear, at least in dried material, not to do so but to remain erect and adhere to each other. In both species the inner ones are shortly clawed but they are thinner in *T. nervosa.* The ripe carpels are larger in *T. nervosa* with longer stalks. In both species the seeds have a circumferential, longitudinal groove.

(3) **T. pumila** (King) J. Sinclair in Gard. Bull. Singapore 14 (1953) 48.

Basonym: Ellipeia pumila King, Mat. F.M.P. Vol. 1 No. 4 (1892) 276 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 34 Pl. 32.

Synonym: Popowia pumila Ridl. F.M.P. 1 (1922) 78; Craib, Fl. Siam. Enum. 1 (1925) 32.

Shrub, 2–3 m. high. *Young twigs* minutely yellowish-brown pubescent, later glabrous, dark coloured and striate. *Leaves* coriaceous oblong-lanceolate to elliptic-lanceolate, apex acuminate, base acute, minutely granular on both surfaces when dry, upper surface glabrous, lower sparsely adpressed-pubescent, becoming glabrous; nerves 9–13 pairs, slender and raised above, prominent below, oblique, rather straight; midrib minutely warted above and below; reticulations visible on both surfaces, a scalariform set and a second set with very close meshes; length 12–20 cm.; breadth 4·5–7 cm.; petiole 3–8 mm. long, pubescent. *Flowers* polygamous, solitary or in pairs, extra-axillary; buds globose. *Pedicels* 2–3 mm. long with two minute bracts. *Sepals* broadly ovate, acute, strigose

outside, glabrous inside, 2 mm. long. *Petals* white, imbricate, lanceolate to oblong-lanceolate, acute, adpressed-pubescent outside, glabrous at base inside; the outer 5 mm. long; the inner 8 mm. long. *Male flowers:* stamens numerous, 2 mm. long with transversely elongate, convex, pubescent connectives; ovaries none. *Female flowers* like the male but with fewer stamens. *Ovaries* about 10, pubescent, stigma short, flat, pubescent (not seen by me). *Ripe carpels* 4–5, cylindric, tapering at each end, minutely granular, thickly pubescent, 1·5 cm. long and 8 mm. broad; stalks 4–5 mm. long. *Seed* 1, pale.

LOWER SIAM: Pulau Tebun, Punga, *Haniff* and *Nur S.F.N. 3571* (S., Kew); Punga, *Curtis 2946* (S., Kew).

PERAK: *Scortechini 198 b* (S., C., Kew) type material; *King 10616* (C.); Ulu Bubong, *King 10053* (S., C.) type material; Larut, *King 5636* (C., Kew) and *5710* (C., D.D.); Tapah, *Ridley 14098* (S.).

TRENGGANU: Bukit Kajang, *Corner S.F.N. 30384* (S.) and *4th November, 1935* (S.).

PAHANG: Gunong Raka, Bentong, *Best S.F.N. 14136* (S.).

SELANGOR: Dusun Tua, *Ridley, May 1896* (S.); Kepong, *Symington 23014* (S.); *27056* (K.); and *22109* (K.); *Ja'amat 17029* (K.); Sungei Lalang, Kajang, *Symington 22904* (S., K.); Batu Caves, *Ridley, August 1908* (S.); Rantau Panjang, *Carrier 24940* (K.); Rawang, *Ridley, May 1896* (S.); Ulu Langat, *Kloss, February 1912* (Kew).

MALACCA: Sungei Ujong, *Alvins 3310* (S.).

JOHORE: Gunong Janeng, *Lake* and *Kelsall, 20th October, 1892* (S).

DISTRIBUTION: Siam and Malaya.

The leaves although smaller are very similar to those of *T. macrophylla*. The flower too is smaller, the petals being more imbricate. The inner petals are much thinner and spreading.

T. pumila however is closer to *T. dubia* (Kurz) Sinclair than to any of the other species and may only be a form of it. The leaves of *T. pumila* are more closely reticulate; the flower has longer pedicels, the petals are more acute and less tomentose. In *T. dubia* the petals are sub-equal. The carpels are similar to those of *T. macrophylla* but are slightly larger.

6. UVARIA Linn. Sp. Pl. (1753) 536.

Scandent or sarmentose shrubs usually with stellate pubescence. *Flowers* usually conspicuous, in terminal or leaf-opposed, few-flowered cymes, sometimes solitary but not axillary. *Bracts* two, a basal and another which is usually medial on the pedicel or sometimes at the base of the calyx. *Sepals* 3, valvate, often connate. *Petals* 6, imbricate in two series, expanding and spreading as flower matures, orbicular, oval or oblong, sometimes connate at the base. *Stamens* many, the outer sometimes sterile and leaf-like,

the fertile flattened, connectives produced and oblique, ovoid-oblong, or sub-foliaceous, sometimes truncate, rarely capitate. *Ovaries* indefinite, linear or cylindric with many ovules in two rows, rarely 1–3 ovules; style very short or inconspicuous, stigma horse-shoe or funnel-shaped with a slit down the inner side. *Torus* depressed, pubescent or tomentose. *Ripe carpels* dry or succulent, often sweet and edible.

TYPE OF GENUS: *U. zeylanica* Linn. Sp. Pl. (1753) 536.

DISTRIBUTION: Mainly tropical Asia with some African and a few Australian species. Over 100 species.

A large genus usually with showy, red or brownish flowers. In the past a good many species wrongly placed in *Uvaria* have been removed to other genera and probably several more will be removed in the course of time. Two species, *U. pauci-ovulata* and *U. Scortechinii,* are rather aberrant in having few ovules but their other characters are of this genus which does also include species with few ovules. *Uvaria* differs from *Anomianthus* in the absence of glands at the base of the inner petals.

U. sphenocarpa from Ceylon has sessile carpels packed very closely together forming a sub-globose fruit, recalling *Annona* but the carpels are free and not united. The Malayan species have stalked carpels, the longest stalks being found in *U. leptopoda* (5–8 cm. long) but *U. lurida,* a Sikkim species has stalks up to 15 cm. long.

KEY

a. Flowers solitary or in short terminal or lateral cymes opposite the leaves. Carpels several-seeded. Connectives oblique, leaf-like and usually produced

b. Calyx entirely covering the petals in flower bud up to the time of opening

c. Diameter of expanded flower over 5 cm. usually 9·5–10·5 cm. (1) **U. grandiflora**

c. Diameter of expanded flower 4·5–5 cm.

d. Petals red. Leaves with stiff, ferrugineous hairs 2–3 mm. long (2) **U. hirsuta**

d. Petals white or greenish yellow. Leaves with softer hairs less than 1 mm. long (3) **U. Curtisii**

b. Calyx not entirely covering the petals in flower bud, the tips of the petals visible

e. Stamens 7 mm. long with much produced connectives, the outer staminodes (4) **U. cordata**

e. Stamens 2–4 mm. long, the outer staminodes or not

f. Leaves glabrous beneath except a sparse pubescence on the nerves

g. Petals oval, blunt, warted, red, 8–10 mm. long (5) **U. Lobbiana**

g. Petals oblong-lanceolate, sub-acute, not warted, yellow, 1·5–1·8 cm. long (6) **U. larep**

f. Leaves tomentose beneath occasionally glabrescent with age

h. Petals obtuse, ovate-rotund or broadly oblong, 1–1·2 cm. long. Tomentum of leaves not rubbed off very easily

i. Leaves on upper surface harsh to touch. Stamens 2–4 mm. long, the outer staminodes (7) **U. rufa**

i. Leaves on upper surface not harsh to touch. Stamens smaller, 2 mm. long, the outer fertile (8) **U. leptopoda**

h. Petals sub-acute, oblong-lanceolate, 1·8–2 cm. long. Tomentum of leaves floccose, easily rubbed off (9) **U. javana**

a. Flowers terminal in cymes on short zig-zag shoots, the lateral branches of which are often reflexed. Carpels 1–3-seeded. Connectives capitate or peltate, little produced

j. Adult leaves glabrous beneath except on nerves, reticulations not prominent (10) **U. pauci-ovulata**

j. Adult leaves tomentose beneath, reticulations prominent (11) **U. Scortechinii**

KEY TO FRUITING SPECIMENS

Note:—Fruit of *U. Curtisii* and *U. Scortechinii* as yet unknown.

a. Carpels several-seeded

b. Fruits elongate, cylindric, 3–6 times as long as broad

c. Tomentum of fruit short, dense, brown, uniform

d. Fruit straight, at times slightly tuberculate, apex slightly acute (1) **U. grandiflora**

d. Fruit falcate, markedly tuberculate, apex acute (6) **U. larep**

c. Tomentum short, dense, mixed with stiff, brown hairs 2–3 mm. long, apex of carpels obtuse (2) **U. hirsuta**

b. Fruit globose or sub-globose or not more than 2½ times as long as broad

e. Fruit glabrous and not tuberculate (4) **U. cordata**

e. Fruit with short tomentum and not tuberculate (7) **U. rufa**

e. Fruit with short tomentum and tuberculate or rough

f. Carpel stalks 2·5 cm. long, about as long as fruit (9) **U. javana**

f. Carpel stalks 4–5 cm. long, carpels spherical or ovoid, tuberculate or rough (5) **U. Lobbiana**

f. Carpel stalks 5–8 cm. long, carpels slightly spherical, more often oblong, slightly tuberculate with irregular bulges due to the seeds (8) **U. leptopoda**

a. Carpels 1–3 seeded, sub-globose, brown-tomentose, often with lateral apiculus (10) **U. pauci-ovulata**

(1) **U. grandiflora** Roxb. Fl. Ind. 2 (1824) 665; Wall. Pl. Rar. As. 2 (1830) T. 121.

Synonyms: U. purpurea Bl. Bijdr. (1825) 11 et Fl. Jav. Anon. (1830) 13 T. 1 et T. 13A; Hk. f. et Th. Fl. Ind. 1 (1855) 95; Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 47; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 266 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 21 Pl. 12; Ridley, F.M.P. 1 (1922) 31. *U. platypetala* Champ. ex Benth. in Kew Journ. Bot. 3 (1851) 257. *U. rhodantha* Hance in Walp. Ann. 2 (1851) 19. *Unona grandiflora* DC. Prod. 1 (1824) 90.

Climbing shrub much branched from the base. *Young twigs* brown, stellate-tomentose. *Leaves* thickly membranous, dark green and shining above, glabrous except the midrib, paler green beneath and stellate-pubescent to stellate-tomentose in varying degrees, oblong-lanceolate to elliptic-oblong, sometimes slightly obovate, acute or shortly acuminate, base rounded and slightly cordate; main nerves 14–17 pairs, slightly depressed above, prominent beneath, rather straight, interarching near margin; reticulations visible on both surfaces; length 11–23 cm., sometimes up to 28 cm.; breadth 6–9·5 cm.; petiole 3–7 mm. long, tomentose. *Flowers* solitary, about 9·5–10·5 cm. in diameter when expanded, slightly fragrant, opposite the leaves with green tomentose leaf-like bracts, one basal and one medial, peduncle about 5 mm. long and pedicel 2–3·8 cm. long. *Sepals* 2–2·5 cm. long, rather papery, yellowish or brownish-green, broadly triangular, sub-concave, very shortly tomentose outside, glabrous inside. *Petals* 3·5–4 cm. long, vermilion-red, turning purplish as they become older, pale at base

inside and outside, oblong to obovate, obtuse, glabrous with several indistinct veins, slightly reflexed at the margin. *Stamens* numerous, 7 mm. long, all fertile, pale yellow, later darkening; connectives produced and oblique. *Ovaries* 7 mm. long, ripening before the stamens, pubescent with funnel-shaped stigmas which are slit down the inner side (the nature of the opening is often obscured in dried specimens by the copious nectar which dries on them); stigmatic surface pale yellow turning black when stamens ripen. *Torus* hemispheric, tomentose. *Ripe carpels* 4–5·5 cm. long, oblong, cylindrical, obtuse, girdled by a faint longitudinal groove, slightly tuberculate, minutely rufous-tomentose, sometimes slightly constricted; stalks 1·3–2·5 cm. long, rufous-tomentose. *Seeds* numerous in two rows, pale brown, flat, oval. **Fig. 6.**

Numerous records from all over the Malay Peninsula except Johore but doubtless also there. Lowland forest.

DISTRIBUTION: Burma, Siam, Indo-China, Borneo, Sumatra, Java, and the Philippines.

var. **tuberculata** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 267 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 21; Ridley, F.M.P. 1 (1922) 31.

Fruit prominently tuberculate.

PERAK: Sungei Nyah, *King 960* (C.) type material; Larut, *King 4786* (C., Kew) type material.

Quite often *Annonaceae* with tuberculate fruits show varying degrees of roughness of the pericarp in the same species. This may not always be a good character on which to make a new variety. The carpels of such tuberculate species tend to be more tuberculate with age. *U. grandiflora,* a handsome species with its large red flowers is certainly allied to *U. hirsuta* and *Curtisii* chiefly in the form of the calyx. The single flowers though several times larger are alike in structure and the carpels too are cylindric like those of *U. hirsuta* although the tomentum is different. *U. grandiflora* often varies in the degree of pubescence of its leaves as does *U. cordata.*

(2) **U. hirsuta** Jack in Malay. Misc. 1 No. 5 (1820) 46; Hooker, Bot. Misc. 2 (1831) 87; Blume, Fl. Jav. Anon. 1 (1830) 22 T. 5; Hk. f. et Th. Fl. Ind. 1 (1855) 99; Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 48; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 267 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 22 Pl. 14; Ridley, F.M.P. 1 (1922) 31.

Synonyms: U. trichomalla Bl. Fl. Jav. Anon. 1 (1830) 42 T. 18. *U. velutina* Bl. (non Roxb.) Bijdr. (1825) 13. *U. pilosa* Roxb. Fl. Ind. 2 (1832) 665.

Woody climber 5–15 m. high. *Young twigs,* midrib, margins and both surfaces of leaves thinly covered with stiff, ferrugineous, erect hairs, simple and stellate, 2–3 mm. long. *Leaves* dark green above, sometimes with a bluish tinge, paler beneath, elliptic-oblong, rarely obovate-oblong, apex acute, sometimes with a filiform acumen 1 cm. long, base narrowed and rounded, emarginate

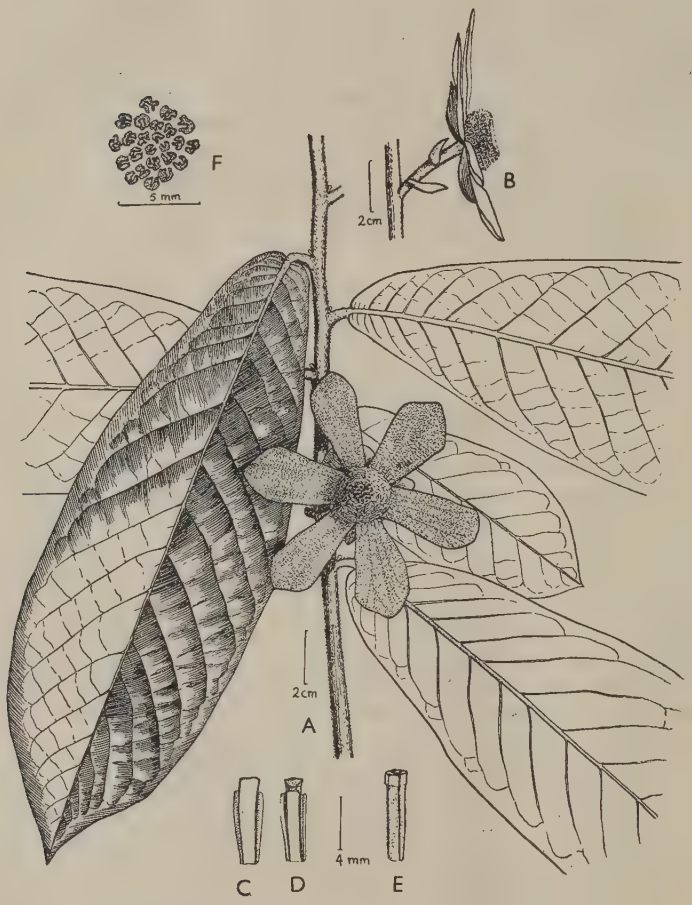


Fig. 6. *Uvaria grandiflora* Roxb.

A, Flowering twig. B, Side view of flower. C, Stamen, back view. D, Stamen, front view. E, Gynoecium. F, Group of stigmata viewed from above.

or slightly cordate; lateral nerves 10–13 pairs, distinct on both surfaces, curving and interarching about 4 mm. from the margin; length 10–18 cm.; breadth 6·5–9 cm.; petiole 5 mm. long. *Flowers* opposite the leaves or extra-axillary, solitary or a rudimentary second present; peduncle 2 mm. long and pedicel 1·8–2 cm. long, hairy, with a minute basal and a somewhat leafy upper bract, 7 mm. long, buds globose, hairy, slightly apiculate. *Sepals* 2–3, very thin and papery, ovate-triangular, acute, outside covered with the same brownish hairs described above, glabrous inside, 1·5 cm. long. *Petals* dark red, reflexed in mature flowers, elliptic, several-veined, acute, both sets sub-equal, sometimes slightly pubescent but often glabrous, diameter of expanded flower about 4·5–5 cm. *Stamens* white at first, then turning darker, 4 mm. long, 4-angled when dehisced, connectives truncate. *Ovaries* 4-angled, 4 mm. long, pubescent, stigma funnel-shaped with a horse-shoe-like opening at the top and a slit down the side next the centre of the flower; copious nectar present. *Torus* hemispheric. *Ripe carpels* orange, cylindric, blunt, sometimes once or twice constricted, 2–3·5 cm. long, tomentum dense, ferrugineous, mixed with stiff hairs; stalks 2–4 cm. long with similar hairs. *Seeds* several in 2 rows, ovoid, plano-convex. **Fig. 7.**

PENANG: Waterfall, *Curtis 1212* (S., Kew); Wall. Cat. *Porter 6458* (C., Kew) and *6458B* (C.).

PERAK: Dindings, *Ridley, s.n., date 1899* (S.); *Curtis s.n., date 1900* (S.); Larut, *King 5920* (S., C.); *3890* (S., C., Kew); *6463* (C., E.); *4597* (C., D.D.); Ulu Bubong, *King 10041* (C., Kew); Gunong Bubu, *King 8350* (C., Kew); Sungkai, *King 743* (C., Kew); Gopeng, *King 676* (C., D.D.); *Scortechini 720* (C.).

TRENGGANU: 36th mile Trengganu-Besut Road, *Sinclair S.F.N. 39940* (S.).

PAHANG: Gali near Raub, *Burkill* and *Haniff S.F.N. 16807* (S., C.).

SELANGOR: Sungei Buloh, *Ja'amat 44949* (K.); Klang, *Fox 2122* (S.); Kuala Lumpur, (*Ridley*) *Native collector 2124* (S., Kew); Bukit Kuda, *Ridley, s.n., 22nd June, 1889* (S.).

NEGRI SEMBILAN: Ulu Rembau, *Nur S.F.N. 11771* (S., Kew).

MALACCA: *Maingay 26* (C., Kew).

JOHORE: Pulau Tinggi, *Burkill S.F.N. 872* (S.).

SINGAPORE: Bedok, *Ridley, date 1897* (S.); Changi, *Ridley, February 1894* (S.); *Cantley,* no locality, *10th December, 1882* (S.); *Anderson 8,* no locality (C., Kew); *Kurz,* no details (C.); Botanic Gardens, Lawn Z, *Furtado S.F.N. 35456* (S. Gardens' Herb., Kew).

DISTRIBUTION: Burma and Malay Islands.

This species is not uncommon in the MacRitchie Reservoir jungle, Singapore.

(3) **U. Curtisii** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 268 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 23 Pl. 24A; Ridley, F.M.P. 1 (1922) 32.

Large climber. *Young twigs* densely rusty-stellate-tomentose. *Leaves* oblong-lanceolate or slightly oblanceolate, apex acute, narrowed to the rounded base, rusty-stellate-tomentose on the sunk midrib above and sometimes or less so on the depressed nerves,

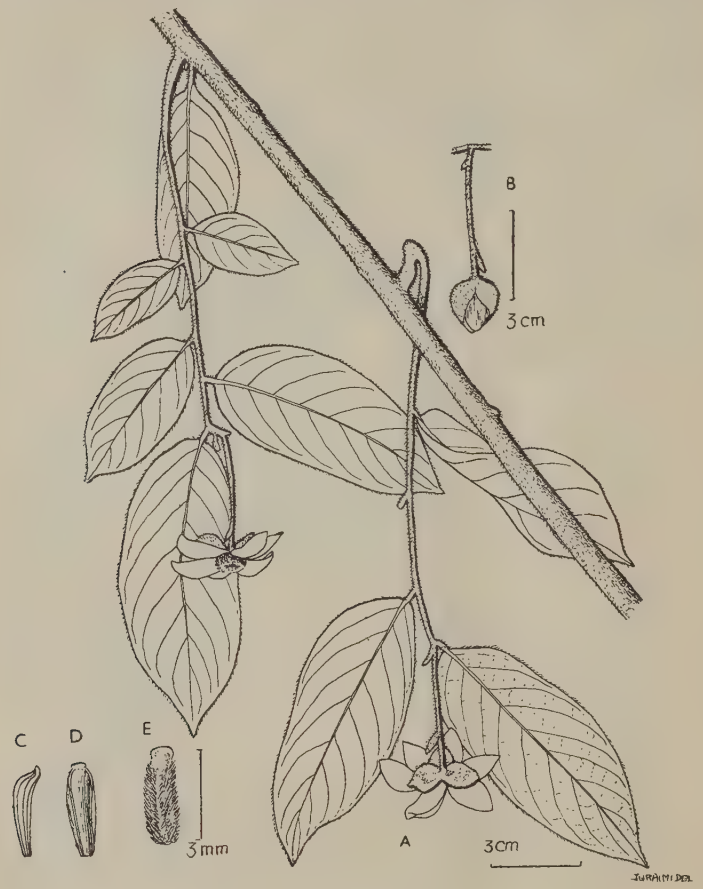


Fig. 7. *Uvaria hirsuta* Jack.

A, Flowering twig. B, Flower bud. C, Stamen, side view. D, Stamen, back view. E, Gynoecium.

thinly tomentose beneath on the entire surface and on the margins, the hairs rather soft and short, less than 1 mm. long, usually about 0·5 mm.; nerves 11–14 pairs, prominent beneath, curving and interarching about 2–3 mm. from margin; reticulations faint above, raised beneath; length 10–23 cm., breadth 4·5–8 cm.; petiole 3–5 mm. long, rusty-tomentose. *Inflorescence* and shape of flower-buds as in *U. hirsuta* but flowers often 2. *Sepals* also similar but with shorter and softer tomentum. *Petals* white or greenish-yellow, slightly narrower than in *U. hirsuta* and more tomentose, tomentose on both surfaces, acute, several-veined, not reflexed in the sheets examined. *Stamens* sessile, 3–4 mm. long, connectives truncate. *Ovaries* numerous, stellate-tomentose, 4 mm. long; stigma funnel-shaped as in *U. hirsuta* with copious nectar; ovules several (about 12, *King*) in 2 rows. *Ripe carpels* not seen.

PENANG: Eper. Nursery and Government Hill, *Curtis 1415* (S., Kew) type material.

PERAK: Ulu Kerling, *King 8543* (C.) type material.

PAHANG: Jerantut, *Burkill and Haniff S.F.N. 16071* (S., K.).

JOHORE: Muar at Biawak, *Curtis 3623* (S., Kew).

SINGAPORE: Kruing Path, Bukit Timah F.R., *Sinclair S.F.N. 39652* (S., Kew, E., L., Par., Bog. D.D., Man.).

DISTRIBUTION: Confined to the Malay Peninsula.

Certainly close to *U. hirsuta* but the shorter and softer hairs less than 1 mm. long give it a different general appearance. The petals are white or greenish-yellow and not red but the structure of the flower and the inflorescence is in general very similar. It also recalls *U. grandiflora* in flower structure but the flowers are smaller and not red. *Sinclair S.F.N. 39652* collected on 27th May, 1953 is the first and only record for Singapore.

(4) **U. cordata** (Dunal) Alston, Hand-Book Fl. Ceylon Part 6 Suppl. (1931) 4.

Basonym: Guatteria cordata Dunal, Anon. (1817) 129 T. 30; DC. Prod. 1 (1824) 93.

Synonyms: Uvaria cordata Wall. Cat. (1832) No. 6486, *nomen nudum. U. macrophylla* Roxb. Fl. Ind. 2 (1824) 663; Wall. Pl. As. Rar. 2 (1830) T. 122; Hk. f. et Th. Fl. Ind. 1 (1855) 97; Hk. f. in Fl. Br. Ind. (1872) 49; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 265 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 19 Pl. 10; Ridley, F.M.P. 1 (1922) 30.

Climber. *Young twigs* dark brown, stellate-pubescent, later glabrous, black and very striate. *Leaves* coriaceous, variable in shape, elliptic-oblong to broadly oblong or oval, apex rounded and then shortly acute or nearly obtuse, base rounded and generally

slightly cordate, stellate-pubescent on the midrib and nerves above and below or nearly glabrous to glabrous; midrib and 10–14 pairs of rather oblique nerves depressed above and prominent beneath; reticulations scarcely distinct above, prominent beneath; length 13–23 cm., average 17 cm.; breadth 8–13 cm., average 9 cm.; petiole 1 cm. long, pubescent. *Flowers* about 4, clustered in short, extra-axillary cymes; pedicels 8 mm.–1 cm. long, tomentose with a small basal and a medial, tomentose, clasping bract. *Sepals* broadly ovate-rotund, obtuse, rusty-tomentose on both surfaces, connate more than half way, 7 mm. long and 1 cm. broad. *Petals* dark red, coriaceous and slightly warted, sub-rotund, obtuse, about 1·2 cm. long, diam. of expanded flower about 4 cm. *Stamens* (outer ones being staminodes 7 mm. long) the fertile stamens a little shorter with oblique, much produced connectives. *Ovaries* 5 mm. long, tomentose with truncate stigmas. *Ripe carpels* numerous, orange, glabrous, globose to oblong, obtuse, 2–3 cm. long with stout stalks 1–1·3 cm. long. *Seeds* several in two rows, dark brown, shining, oval.

A common species found throughout the Peninsula in lowland forest. The localities are very numerous. The pubescence and shape of the leaves vary considerably.

DISTRIBUTION: India, Burma, Ceylon, Siam, Indo-China, Java, Philippines, New Guinea.

Alston in Hand-Book Fl. Ceylon Part 6 Suppl. (1931) 4 has attributed the combination *Uvaria cordata* (Dunal) to Wallich. Unfortunately *Wall. Cat. 6486* has the following note *"Uvaria cordata* Dunal (*sub Uvariis*)" which cannot be accepted because it has no basonym. Had it been *"sub Guatteriis"* the combination would have been validly published, because Dunal had actually published the binomial *Guatteria cordata*. Possibly *"sub Uvariis"* was an error for *"sub Guatteriis"*.

(5) **U. Lobbiana** Hk. f. et Th. Fl. Ind. 1 (1855) 100 et in Fl. Br. Ind. 1 (1872) 49; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 264 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 19 Pl. 9; Ridley, F.M.P. 1 (1922) 30.

Synonym: U. ptychocalyx Miq. in Ann. Mus. Bot. Lugd.-Bat. 2 (1865) 4; King in Ann. Roy. Bot. Gard. Calc. 4 (1893) 31 Pl. 28. *U. sub-repanda* Wall. Cat. 6483.

Climber 30–50 m. high. *Young twigs* sparsely stellate-pubescent, soon becoming glabrous and dark coloured. *Leaves* somewhat coriaceous, dark glossy green above, medium green beneath, oblong or oblong-lanceolate, obtuse or bluntly acute with rounded base, sometimes slightly emarginate, glabrous above and with a

few scattered stellate hairs on the midrib beneath and sometimes but very sparsely on the 14–18 pairs of nerves; reticulations visible and fairly distinct on both surfaces; length 11–18 cm.; breadth 4–6·5 cm.; petiole 7 mm. long with a number of rings, stellate-pubescent. *Inflorescence* of 2–3 nearly sessile flowers in leaf-opposed or extra-axillary cymes with a small basal and larger median (5–7 mm. long) amplexicaul, tomentose bract. *Sepals* connate, tomentose outside, minutely pubescent inside, broadly ovate, obtuse, about 6 mm. long. *Petals* red, the centre of the flower yellow (Nur); flower red with white petals (King's collector); flower red (Ridley), coriaceous, tomentose, distinctly verrucose on both surfaces, broadly oval or obovate, very obtuse, 8–10 mm. long. *Stamens* 2 mm. long with compressed, oblique or truncate connectives. *Ovaries* 4-angled, pubescent except the truncate, lobulate stigma. *Ripe carpels* numerous, ovoid or spherical, tubercled, or only slightly rough, pubescent, 2–2·5 cm. long; stalks slender, 4–5 cm. long, pubescent. *Seeds* plano-convex, smooth, 10 in 2 rows of 5 in one carpel examined.

PENANG: Waterfall, *Curtis 1234* (S.); near the Spout, *Curtis 841* (S., C., Kew); Government Hill, *Curtis s.n. May 1898* (S., Kew); Road to Spout, *Curtis 1408* (S., C.); Pulau Boetong Reserve, *Curtis 2744* (S., C., Kew); Moniot Road, East, *Sinclair S.F.N. 39351* (S., Kew).

PERAK: Larut, *King 11787* (S., C.); Gopeng, *King 4787* (Kew).

PAHANG: Pulau Tioman, *Nur S.F.N. 18876* (S.).

SELANGOR: Jackson's Estate, Gua Batu, *Ridley 8247* (S.); Ampang Catchment Area, *Hamid C.F. 1050* (K.).

MALACCA: Bukit Bruang, *Derry 429* (S.); *Maingay 27* (C., Kew) and *30* (C., Kew) both type material; *Griffith, date 1845* (Kew) type material; *Griffith 434* (Kew) type material, and *435* (Kew) type material.

SINGAPORE: Gardens' Jungle, *Ridley 9211* (S., Kew).

DISTRIBUTION: Burma, Siam, Sumatra, Borneo.

King in Ann. Roy. Bot. Gard. Calc. 4 (1893) 32 states that *Curtis 1408* agrees with *Wall. Cat. 6483, U. sub-repanda,* as to the leaves and branches but he hesitates to identify it with *U. sub-repanda.* Ridley in F.M.P. 35 under *U. sub-repanda* quotes the Curtis Pulau Boetong specimens but he also states that he does not think they belong to a *Uvaria* at all.

I have identified *Curtis 1408* and *2744* as *U. Lobbiana* and have seen Wallich's specimen *6483* in the Herbarium at Calcutta and Kew, which is also *U. Lobbiana.* The Kew specimen *Wallich 6483* has an immature flower placed in a capsule and on the capsule is written—"the flower was taken for the analysis of a plate for Dr. King's Annonaceae in the Annals of the Calcutta

Garden. It is in this capsule." One can see the exact place on the leaf specimen where the flower has been removed. This is indicated with a cross. With the flower-pedicel a continuous thin, stalk-like portion of bark has been removed giving a false impression of the length of the pedicel. There is then a slight gaping wound on the stem which has become opened out. The leaf mounted close at this point does not belong there, and the flower, although it looks at first sight axillary and was figured as such by King in Ann. Roy. Bot. Gard. Calcutta 4 (1893) Pl. 177, is not really so but in the normal position.

The leaves of *U. Lobbiana* bear some resemblance to those of *Cyathostemma Hookeri* but those of the latter are never emarginate at the base while its flowers are many times smaller, have longer pedicels and minute bracts. *U. Lobbiana* is not likely to be confused with any Malayan *Uvaria.* Korthals' type of *U. ptychocalyx,* Sumatra, (specimen in Herb. Kew) and *Krukoff 4126* named *U. ptychocalyx* (specimen in Herb. Sing.) are identical with *Lobbiana.* Also Miquel's description and King's plate agree.

(6) **U. larep** Miq. Fl. Ind. Bat. Suppl. (1861) 370; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 262 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 16. Pl. 4; Ridley, F.M.P. 1 (1922) 29.

Woody climber 7–14 m. long with minutely pubescent twigs, becoming glabrous when old. *Leaves* light green, membranous, elliptic to obovate-elliptic, glabrous above except the pubescent midrib, pubescent beneath with stellate hairs, becoming glabrous when old, base rounded or slightly emarginate, apex acute; midrib and 12–14 pairs of nerves prominent beneath, the latter less prominent above or slightly sunk and interarching near the margin; reticulations distinct beneath, forming a loose network; length 12–16 cm.; breadth 5·5–7·5 cm.; petiole 3–5 mm. long, stellate-pubescent. *Inflorescence* opposite the leaves or extra-axillary, 1–2 flowered, one of the flowers often abortive. *Pedicels* 1·8–2 cm. long, stellate-pubescent with a minute basal and median bract; flower buds globular. *Sepals* connate at base, broadly ovate, acute, densely and minutely pubescent on both surfaces, 4–5 mm. long. *Petals* pale yellow, spreading, sub-equal, the inner slightly narrower, oblong-lanceolate, acute, pubescent on both surfaces like the sepals, 1·8–2 cm. long and about 6 mm. broad at the middle. *Stamens* numerous, 3 mm. long, connectives truncate and slightly produced. *Ovaries* numerous, 3 mm. long, angled, puberulous, with a few, long, projecting hairs near apex. *Torus* sub-globose, minutely hairy. *Ripe carpels* several, cylindric-oblong, falcate,

densely and minutely pubescent in dried specimens, surface wrinkled, apex slightly pointed; length 4–5·5 cm.; breadth 1–1·3 cm.; stalks stout, about 3 cm. long, pubescent like the carpels. *Seeds* several.

PERAK: Taiping, *Ridley 11916* (S., Kew); *Wray 1826* (S., C., Kew); Larut, *King 4011* (S., C., Kew); Padang Rengas Reservoir, *Haniff S.F.N. 14971* (S.).

DISTRIBUTION: Sumatra.

A little-collected species best distinguished from the other Malayan ones by its falcate carpels. The rather narrow, elongated petals resemble those of *U. javana* but the leaves of that plant are much more tomentose beneath with a marginal fringe of fluffy tomentum.

(7) **U. rufa** Bl. Fl. Jav. Anon. (1830) 19 T. 4, 13C; Finet et Gagnep. in Fl. Gén. de L'Indo-Chine 1 (1907) 51; Merr. Enum. Phillip. Pl. 2 (1923) 156; Craib, Fl. Siam. Enum. (1931) 31.

Synonyms: U. astrosticta Miq. Fl. Ind. Bat. Suppl. (1861) 370 et Ann. Mus. Bot. Lugd.-Bat. 2 (1865) 8; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 272 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 30 Pl. 27A; Ridley, F.M.P. 1 (1922) 34. *U. Ridleyi* King, Mat. F.M.P. Vol. 1 No. 4 (1892) 268 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 23 Pl. 24B; Ridley, F.M.P. 1 (1922) 32. *U. Branderhorstii* Burck in Lorentz, Nova Guinea 8 (1911) 427.

Climber. *Young twigs* rusty-stellate-tomentose, slowly becoming glabrous, lenticels numerous. *Leaves* rather variable in size and shape, sub-coriaceous, elliptic-lanceolate to oblong, apex bluntly acute or shortly acuminate, base slightly cordate or emarginate; upper surface scabrid, due to very short, harsh, stellate hairs, drying silvery, less often dark, pubescent on the midrib and nerves; lower surface densely to thinly stellate-tomentose, tomentum obscuring the reticulations; nerves 10–13 pairs, distinct on both surfaces, thin like those of *U. leptopoda* but the interarching more distinct; length 7·5–13 cm.; breadth 3–6 cm., average 4·5 cm.; petiole 5–7 mm. long, tomentose. *Inflorescence* a cyme of 3–4 flowers, opposite the leaves or below them by growth of the stem; peduncles about 2 mm. long and pedicels about 7 mm. long with a medial, obtuse, tomentose bract, 3–4 mm. long; buds globose. *Sepals* nearly orbicular, obtuse, rusty-stellate-tomentose on both surfaces, joined above base, 3 mm. long and 4 mm. broad. *Petals* dull reddish-purple, spreading, about 1·2 cm. long, broadly oblong, obtuse, minutely pubescent on both surfaces; inner slightly narrower, with a very short claw; the outer not clawed. *Stamens* 2–4

mm. long, larger than in *U. leptopoda,* the outer staminodes; connectives of the fertile truncate and much produced (about ¼ length of the whole stamen). *Ovaries* 4 mm. long, quadrate, pubescent, stigma truncate, its groove obscured in herbarium material by copious nectar secretions. *Torus* with bristle-like stellate hairs. *Ripe carpels* few, about 6, ovoid to oblong, obtuse, scabrous-pubescent as are the stalks, about 2·5 cm. long; stalks stout, 2·5–3 cm. long. *Seeds* many in 2 rows, oval, reddish-brown, smooth, shining.

LOWER SIAM: Kampengpet, *Kiah S.F.N. 24351* (S., K., Kew); Setul, *Ridley 15181* (S., C., Kew).

PERLIS: Mata Ayer, *Henderson S.F.N. 23046* (S.).

KEDAH: East of Langgar, *Burkill* and *Haniff S.F.N. 13332* (S.).

PROVINCE WELLESLEY: Tasek Glugor, *Curtis, April 1902* (S.).

PERAK: *King 1773* (C.); *Scortechini 37* (C.); *121 b* (Kew).

PAHANG: Pekan, *Ridley, August 1889* (S., C., Kew) and *Burkill* and *Haniff S.F. Nos. 17226* (S.) and *17236* (S.); *Ridley 115* (S., C.); Kalambalai River, *Ridley August 1891* (S.); Kuala Brok, *Ridley, date 1891* (S.); Sungei Chenei, *Fox 5019* (S., C., E., Kew); Kuala Sg. Kinchan Chini, Kuantan, *Lambak C.F. Field No. 2709* (S., K., Kew).

DISTRIBUTION: Siam, Java, Sumatra, Indo-China, Philippines, New Guinea.

Easily distinguished from *U. leptopoda* by the scabrid upper surface of the leaves, the larger stamens, and the carpels with shorter stalks, 2·5–3 cm. long as against 5–8 cm. in *U. leptopoda.* Type of *U. rufa* from Java in Herb Kew.

(8) **U. leptopoda** (King) R.E. Fries in Arkiv för Botanik, Band 3, nr 2 (1953) 40.

Basonym: Ellipeia leptopoda King, Mat. F.M.P. Vol. 1 No. 4 (1892) 274 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 33 Pl. 30.

Synonym: Uvariella leptopoda Ridley, F.M.P. 1 (1922) 35.

Climber 15–20 m. high or more. *Young twigs* densely stellate-brown-tomentose. *Leaves* coriaceous, obovate-oblong or elliptic, apex rounded and then obtuse or bluntly acute, narrowed below to the rounded, emarginate base; upper surface pubescent on the midrib and slightly on the depressed nerves, smooth to the touch, drying silvery or dull brown with a sort of metallic lustre; lower surface covered with a buff, floccose, stellate tomentum which tends to rub off with age (tomentum not so copious nor rubbing off so easily as in *U. javana*), margins rigid and very slightly revolute; nerves about 10 pairs, distinct but thin, ascending, running out to margin, line of interarching very faint and most often not visible; reticulations very faint on upper surface and not visible beneath if copious tomentum is present; length 7–15 cm.,

average 9 cm.; breadth 4·5–6·5 cm.; petiole tomentose, 5–7 mm. long. *Inflorescence* opposite the leaves or below them, not axillary, consisting of 2–4 flowers in cymes with basal and medial, tomentose, clasping bracts, pedicels about 5 mm. long, tawny-tomentose. *Sepals* semi-orbicular, obtuse, joined at the base, stellate-tomentose on both surfaces, 7 mm. long and about 6 mm. broad. *Petals* about 1 cm. long, dark crimson, ovate-rotund, very obtuse, coriaceous, slightly pubescent on both surfaces, inner slightly narrower and clawed, outer not. *Stamens* 2 mm. long with oblique, pubescent, spoon-shaped, much-produced connectives. *Ovaries* 2–3 mm. long, pubescent with truncate stigmas and copious nectar. *Ripe carpels* numerous on a hemispherical torus, brownish-purple to brown, oblong, occasionally nearly globose, very shortly tomentose, with a slightly tuberculate surface and irregular bulges and furrows due to the seeds; stalks 5–8 cm. long, stout, tomentose with several grooves. *Seeds* 5–8 in 2 rows in the best developed carpels but often one in under-developed carpels on the same torus, dark-brown, shining, smooth.

PERAK: Larut, *King Nos. 7566* and *2935* and *December 1894* (C.) type material; Tupai, *Wray 2439* (S., C.).

MALACCA: *Cantley 37* (S.).

JOHORE: Muar, *Curtis 3617* (S.); Castlewood, Tebrau River, *Ridley 12215* (S.); Sedili River, *Kostermann, August 1938* (S.); Kangka, Sedili Kechil, *Corner S.F.N. 28580* (S., K.; Kew); Mawai, *Corner S.F.N. 28443* (S., Kew).

SINGAPORE: Jurong, 15th mile, *Corner, 13th November, 1932* (S.); Jurong, *Corner S.F.N. 26153* (S., C., Kew); Bukit Mandai, *Ridley 4708* (S., C.) type material; and *5822* (S., C.) type material; *Toas, Goodenough 2124* (S., C.); Kallang Valley Forest, *Burkill S.F.N. 7834* (S.); Cluny Road, *Murton 5* (S.); off 8th mile West Coast Road, Pasir Panjang, *Sinclair S.F.N. 39431* (S.).

DISTRIBUTION: Confined to the Malay Peninsula.

There has been great confusion between *Uvaria leptopoda* and *U. rufa*, (*syn. U. Ridleyi*) and even *U. javana* (*syn. U. dulcis*) has been confounded with them. In Ridley's time there would have been only two fruiting sheets of *Uvaria leptopoda* in the Singapore Herbarium. His own sheet *5822* he wrongly named *Uvaria Ridleyi*. It is a good specimen with numerous, mostly several seeded carpels while one or two under-developed ones have only one seed. The other *Wray 2439* is named *Ellipeia leptopoda* and *Uvariella leptopoda*. Unfortunately this sheet has two under-developed carpels with one seed in each. They are in a packet and not attached to the specimen. Of the flowering sheets he names *Ridley 4708, Ellipeia leptopoda* and the remainder *Uvaria Ridleyi* and *Uvaria* sp.

Fig. 8. Fruits of *Uvaria.*

A, *U. Lobbiana* Hk. f. et Th. B, *U. javana* Dunal. C, *U. larep* Miq. D, *U. grandiflora* Roxb. E, *U. cordata* (Dunal) Alston.

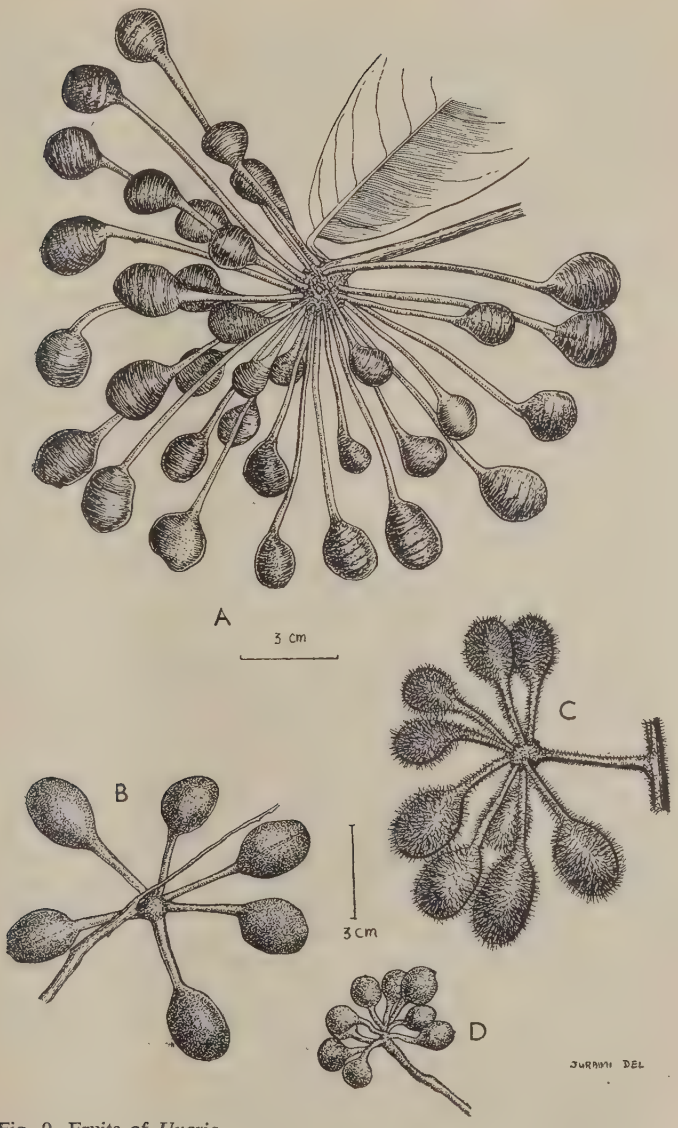


Fig. 9. Fruits of *Uvaria*.

A, *U. leptopoda* (King) R. E. Fries. B, *U. rufa* Bl. C, *U. hirsuta* Jack. D, *U. pauci-ovulata* Hk. f. et Th.

King obviously did not understand the genus *Ellipeia* as typified by *E. cuneifolia* Hk. f. et Th. when he included two species of *Trivalvaria* in it (see discussion under *Trivalvaria*). Ridley apparently after further examination was not satisfied with King's placing of this species in *Ellipeia,* but unfortunately he was misled by the one seeded, under-developed carpels and by insufficiency of material and he created the unnecessary genus *Uvariella* [F.M.P. 1 (1922) 35].

(9) **U. javana** Dunal, Anon. (1817) 91 T. 14.

Synonym: U. dulcis sensu Auctt. non Dunal; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 263 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 18 Pl. 8; Ridley, F.M.P. 1 (1922) 30, omnino pro parte.

A climber up to 33 m. high. *Young twigs* with a floccose, stellate pubescence. *Leaves* rather variable in size and shape, elliptic, elliptic-obovate or oval, base rounded, often unequal-sided, apex abruptly acute or sub-acute; upper surface thinly stellate-pubescent, lower surface with a floccose, light brown, stellate tomentum which rubs off easily with the fingers, the margins and upper midrib densely covered by this tomentum; nerves 9–12 pairs, curving slightly, depressed above and prominent beneath, interarching at the very margin; length 11–19 cm., breadth 6–9 cm.; petiole 5–7 mm. long. *Flowers* 1–2, opposite the leaves or extra-axillary on pedicels 1·4–1·8 cm. long with a minute basal and slightly larger upper or median bract (2 mm. long); buds ovoid-globose, tomentose. *Sepals* ovate, acute, densely tomentose on both surfaces, connate at the base, slightly reflexed, about 6 mm. long. *Petals* spreading, oblong-lanceolate, sub-acute, more or less equal, tomentose on both surfaces, 1·8–2 cm. long. *Stamens* numerous 2 mm. long with oblique, much produced connectives. *Ovaries* numerous, tomentose, 2 mm. long. *Torus* depressed, hemispheric, with a few erect hairs. *Ripe carpels* numerous, ovoid to nearly spherical, often oblique, blunt at apex, unequally tuberculate, densely and loosely rusty-stellate-tomentose, 1·8–2 cm. long; stalks 2·5 cm. long with similar tomentum. *Seeds* several.

PENANG: Pantai Achie; Ayer Etam; Muka Head, *Curtis,* all numbered *729* (S.); Moniots Road, *Curtis 1414* (S., Kew).

PERAK: Larut, Gopeng, *King 5945* (S., C., D.D., Kew); Dindings. Lumut, *Ridley 8600* (S., Kew); Ulu Bubong, *King 10539* (C., Kew); *10874* (C.).

NEGRI SEMBILAN: Senaling Inas, *Symington 42970* (K.).

MALACCA: *Alvins 2182* (S.); Selandor, *Goodenough 1822* (S., C.); *Maingay 25* (C., Kew); *Griffith 436* (Kew).

JOHORE: Mt. Austin, *Ridley 12574* (S.).

DISTRIBUTION: Java.

This plant must not be confused with *Uvaria dulcis* Dunal which it resembles and which is now called *Anomianthus dulcis* (Dunal) Sinclair—See Gard. Bull. Singapore 14 (1953) 50. Synonyms are: *A. heterocarpus* Zoll. in Linnaea 29 (1857–58) 324; Boerl. in Icon. Bogor. 1 (1899) 96 T. 28 and *Uvaria pachychila* Merr. in herbario. In *Anomianthus* the inner petals have two basal glands which in dried material are not always obvious. Dunal makes no mention of this and his descriptions of both *U. dulcis* and *U. javana* are practically in the same words. He did not see fruiting specimens. Boerlage in Icon. Bogor. 38 (1899) 96–97 shows how *U. dulcis* is separated from *Anomianthus* and I follow him. *Uvaria javana, leptopoda* and *rufa* resemble each other somewhat in leaf characters but the first may be separated from the other two by the fringe of floccose tomentum present on the leaf margins as well as the felt on the leaves themselves, if it has not been rubbed off. The upper surface of the leaf of *leptopoda* is smooth and in dried specimens often darker, while in *rufa* it is harsh and often silvery; *javana* is somewhat intermediate but not harsh. The leaf base of *rufa* is emarginate or slightly cordate and not unequal-sided as in *javana*. *U. javana* has the smallest median flowering bract (2 mm. long), *rufa* comes next (3–4 mm.) while *leptopoda* has the largest (5–6 mm.). If flowers and fruit are present there should be no difficulty in identification.

(10) **U. pauci-ovulata** Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 51; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 269 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 25 Pl. 16; Ridley, F.M.P. 1 (1922) 32.

Stout climber with rusty-brown, stellate-pubescent, striate twigs. *Leaves* coriaceous, varying much in size, those on flowering branches 4–5 times smaller in area than the rest (they may become larger later), elliptic-oblong, obtuse or bluntly acute with slightly cordate base, glabrous, dark green and shining above, medium green and sparsely stellate-pubescent beneath on the midrib and nerves, becoming almost glabrous; nerves 10–14 pairs, impressed above, prominent beneath, rather close together, oblique, the line of interarching often broken, reticulations close, visible on both surfaces but not prominent; average length of leaves on sterile shoots 11–12 cm.; average breadth 4–5·5 cm.; average length on flowering shoots 5–7 cm. and breadth 3·5 cm.; petiole 3 mm. long, rusty-tomentose. *Inflorescence* (different from the other species) terminal on short zig-zag, scurfily-pubescent shoots, the peduncles or lateral branches of which are often deflexed at an angle of 45° to the main axis, the flowers in cymes of 2–4 on the peduncles.

pedicels 5–7 mm. long, rusty-tomentose, each flower with a bract immediately below the calyx and another at base of pedicel. *Sepals* rusty-stellate-tomentose outside, less so inside, ovate-orbicular, sub-acute, connate below, 6–7 mm. long. *Petals* 1·7–2·5 cm. long, rusty, yellow-brown, stellate-tomentose outside, glabrous inside except on the upper third, sub-connivent, with several indistinct veins, the outer ovate-rotund, the inner slightly narrower. *Stamens* (different from the other species) 1–1·5 mm. long with capitate, little-produced connectives. *Ovaries* 3 mm. long, stellate-pubescent with funnel-shaped stigmas having a slit down the inner side, 1–3 ovules. *Ripe carpels* sub-globose with a short apiculus, often lateral, recalling those of *Ellipeia cuneifolia,* minutely brown-stellate-tomentose, 1–1·5 cm. long; stalks 1–1·5 cm. long with similar pubescence. *Seeds* 1–2 only, dark brown, shining.

PENANG: Highlands, *Curtis 825* (S., C.).

PERAK: Larut, *King 6748* (C.).

SELANGOR: Sungei Buloh, *Foxworthy 17051* (S., K.).

MALACCA: *Maingay 104* (C., Kew) type material.

JOHORE: Gunong Pulai, *Ridley 12178* (S., Kew); Sungei Kayu, *Kiah S.F.N. 32128* (S.).

SINGAPORE: Bukit Timah, *Ngadiman S.F.N. 36432* (S.); Botanic Gardens, Cluny Road, *Haniff, Gardens' Herb., 22nd June, 1925.* (S., Kew).

DISTRIBUTION: Confined to the Malay Peninsula.

Differs from the other *Uvaria* species in the few seeds, the stamens with capitate, little-produced connectives and in the inflorescence described above, but agrees in other characters. It is closely allied to *U. Scortechinii* which has been collected once and in flower only.

(11) **U. Scortechinii** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 269 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 25 Pl. 17; Ridley, F.M.P. 1 (1922) 33.

A sarmentose flexuose shrub. *Young branches* and *petioles* densely covered with rusty, floccose, rufous tomentum. *Leaves* coriaceous elliptic to elliptic-rotund, obtuse, very slightly or not at all narrowed to the rounded or minutely cordate base; upper surface shining, glabrescent or glabrous, the deeply impressed midrib and nerves tomentose, transverse veins depressed when dry; undersurface minutely and softly rufous-pubescent especially on the midrib, nerves and reticulations which are all bold and prominent; main nerves 10–12 pairs, spreading below, sub-ascending above, forming double arches within the edge; length 10–18 cm.; breadth 6·5–10 cm.; petiole 4–9 mm. long. *Flowers* 3·8 cm. in

diameter, either in terminal umbels of 2–3, or in many-flowered lateral panicles 10 cm. in length; peduncles 1·2–1·8 cm. long, bracts numerous, but chiefly towards the apices of the peduncles, ovate-orbicular, covered with short, rufous, flocculent tomentum as are the branches and axes of the panicles. *Sepals* fleshy, triangular, sub-acute, connate in the lower third, concave, spreading, minutely pubescent. *Petals* fleshy, about 2·5 cm. long, connivent; the outer 3 ovate-rotund, very obtuse, tomentose-pubescent on both surfaces; the outer surface with some small superficial scales, the inner with a round, glabrous spot at the base; inner 3 petals obovate, narrowed at the base, pubescent outside, glabrous inside, except a broad pubescent band near the apex. *Anthers* sessile, angled, the connective projecting beyond the apex, broadly truncate, almost peltate. *Ovaries* several with a few stellate hairs, 2-3-ovuled; style cylindric, curved, glabrous. *Fruit* unknown.

PERAK: *Scortechini 1990* (C., Kew) type.
DISTRIBUTION: Confined to Malaya.

The description is taken from King. This species has only been collected once. The form of the inflorescence and stamens is very similar to that of *U. pauci-ovulata*. Both have few ovules and in this respect differ from other *Uvaria* species. *U. Scortechinii* has larger leaves more densely covered with tomentum which is slightly floccose. The inner petals are more narrowed at the base than those of *U. pauci-ovulata*. It is desirable that one should see more material of both species to determine their relationship.

7. CYATHOSTEMMA Griffith, Notulae 4 (1854) 707 et Icones Pl. 4 (1854) T. 650.

Woody climbers mostly with simple hairs, sometimes stellate. *Flowers* globose or nearly globose in pendulous or clustered cymes from the old wood or extra-axillary. *Sepals* valvate. *Petals* valvate at base, imbricate at tips, coriaceous, convex outside, not expanding or reflexed, only a small opening 3–5 mm. in diameter at the top of the bud, the outer with thickened base not or scarcely clawed, the inner shortly clawed and slightly narrower. *Stamens* numerous, sessile with oblique incurved connectives. *Ovaries* many, pubescent, with U-or horse-shoe-shaped stigma, split down the inner side. *Ovules* many to few in two rows.

TYPE OF GENUS: *C. viridiflorum* Griff. Notulae 4 (1854) 707 et Icon. 4 (1854) T. 650.

DISTRIBUTION: Mostly confined to Malay Peninsula but one species *C. micranthum* (*Uvaria micrantha*) Burma to New Guinea. Species 8.

A genus very close to *Uvaria* but differing in the globose flowers, the petals of which do not expand and are imbricate at the tips only. The reticulations on the leaves form a very close network.

KEY

a. Flowers all hermaphrodite
  b. Flowers dark purple (1) **C. argenteum**
  b. Flowers yellow, greenish or white
    c. Leaves glabrous on lower surface; ripe carpels glabrous
      d. Ripe carpels large, more than 1·5 cm. long, thick-walled with stalks more than 2 mm. thick
        e. Flowers in ferrugineous, pendulous cymes on the older twigs and wood; peduncle several centimetres long, its branches with distichous, 5 mm. long bracts; leaves drying greenish or silvery (2) **C. viridiflorum**
        e. Flowers in short erect cymes opposite the leaves; peduncle 1–2 mm. long, bracts not distichous, less than 5 mm. long; leaves drying black or rusty brown (3) **C. Hookeri**
      d. Ripe carpels small, less than 1·5 cm. long, thin-walled with slender stalks less than 2 mm. thick
        f. Leaves 16–29 cm. long and 6–10 cm. broad; drying dark-greenish to blackish; flower buds about 1 cm. in diam. (4) **C. Wrayi**
        f. Leaves 6–14 cm. long and 2–3·5 cm. broad; drying black or rusty-brown; flower buds about 5 mm. in diam. (5) **C. micranthum**
    c. Leaves stellate-pubescent on the lower surface sometimes becoming glabrous; ripe carpels tawny-stellate-tomentose (6) **C. excelsum**
a. Flowers dimorphous, some female (7) **C. acuminatum**

(1) **C. argenteum** (Bl.) J. Sinclair in Sarawak Mus. Journ. Vol. 5 No. 3 (1951) 599.

Basonym: Uvaria argentea Bl. Fl. Jav. Anon. 1 (1830) 24 T. 6 and 13 D.

Synonyms: U. bracteata Roxb. Fl. Ind. 2 (1832) 660. *U. Gomeziana* A. DC. Mém. Soc. Phys. Genève 5 (1832) 203.

Climber. *Young twigs* minutely rusty-pubescent, later glabrous and finely striate, reddish-brown. *Leaves* membranous to sub-coriaceous, oblong-lanceolate or oblong-oblanceolate, green above and slightly silvery-grey beneath, apex acute, base gradually narrowed and rounded, minutely puberulous with stellate hairs when very young, later glabrous except for the rusty-pubescent midrib above; nerves 12–14 pairs, slightly prominent on both sides, curving and ascending and interarching in a faint broken line near margin; reticulations visible on both surfaces forming a close network. *Flowers* extra-axillary, cymose, 1–3. One obtuse, leaf-like bract 7 mm. long at base of pedicel and a smaller obtuse one higher up. *Sepals* broadly ovate, obtuse, coriaceous, 2 mm. long. *Petals* sub-equal, about 5 mm. long, broadly ovate, obtuse, inflexed at the apices, thick, dark purple, inner more concave. *Stamens* numerous, pale brown, 2–2·5 mm. long. *Ovaries* 15–20, rufous-pubescent, elongated, 3 mm. long, stigma deeply cleft on the adaxial side. *Ripe carpels* oblong, slightly apiculate, minutely tomentose, slightly constricted with rough surface, walls hard, 5 mm. thick, 4 cm. long and 2·3 cm. broad, stalks stout, 4 cm. long. *Seeds* several in two rows, smooth.

PAHANG: Raub, *Kalong 20243* (S., K.).

SELANGOR: 8th mile Ulu Gombak, *Strugnell 13390* (S., K.); Kepong, *Symington 24521* (K.).

DISTRIBUTION: East Bengal, Burma, Sarawak *Clemens 21341*, Java.

I have included *Uvaria bracteata* Roxb. as a synonym, the type of which, *Wall. Cat. 6468*, is in Herb. Kew.

(2) **C. viridiflorum** Griff., Notulae 4 (1854) 707 et Icones Pl. 4 (1854) T. 650; Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 57; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 257 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 11 Pl. 37; Ridley, F.M.P. 1 (1922) 27.

Climber 15–25 m. high, often in swampy forest. *Young twigs* slightly pubescent, older nearly black and conspicuously striate. *Leaves* coriaceous, oblong-elliptic or oblong-lanceolate, medium green above and paler green beneath when fresh, when dry bluish-grey on the upper surface and somewhat silvery-grey beneath, glabrous; apex acute, base rounded and emarginate; nerves 10–13 pairs, distinct above and prominent on the lower surface, curving rather irregularly, ascending steeply and interarching near the margin in a broken line; reticulations visible but not prominent; length 12–17 cm. (sometimes up to 27 cm.); breadth 5·5–8 cm.; petiole 5–7 mm. long, pubescent. *Inflorescence* of dichotomous cymes arising on long, slender, rusty-tomentose peduncles from the

thicker stems (1 or several arising from the same place), the distichous bracts often persisting after the flowers have fallen, producing a zig-zag appearance, one basal, tomentose bract at each bifurcation and one about the middle of each pedicel; buds globose, apiculate, opening slightly at the top but the petals not expanding. *Sepals* broadly ovate, obtuse, connate, rusty-tomentose, often reflexed, 3 mm. long and 5 mm. broad. Petals 5 mm. × 5 mm., greenish-yellow, coriaceous, ovate, acute, convex on outer, concave on inner surface, slightly pubescent; outer with a thick rudimentary claw or incurved base, the inner slightly narrower with a similar thick but more distinct claw. *Stamens* numerous, white, 2 mm. long, connective truncate, slightly incurved. *Ovaries* 4 mm. long, ripening before stamens, tomentose with U-shaped or horse-shoe-shaped, brownish stigma, split on the inner side; style absent. *Ripe carpels* oblong-ovoid, obtuse, glabrous, with irregular bulges due to the seeds, thick-walled, 2·5–4 cm. long; stalks stout, 2 cm. long. *Seeds* 5–6 in 2 rows.

PERLIS: Kaki Bukit, *Kiah S.F.N. 35304* (S., K., Kew).

PERAK: Larut, *King 5857* (S., C., Kew), quoted by King as *C. Scortechinii; Scortechini 5000* (S., C.), also quoted by King as *C. Scortechinii.*

PAHANG: Kota Glanggi, *Ridley, August 1891* (S.); Sungei Tras near Raub, *Burkill* and *Haniff S.F.N. 16865* (S.).

NEGRI SEMBILAN: Gunong Tampin, *Burkill S.F.N. 3163* (S.); Bukit Plangi, *Nur S.F.N. 2540* (S.).

MALACCA: *Maingay 35* (Kew) type; *Maingay 36* (Kew); *Cantley's collector 329* (S.).

JOHORE: S. Kayu Ara, Mawai-Jemaluang Road, *Corner S.F.N. 29460* (S., C., Kew); Kampong Simpai, *Lake and Kelsall, 5th November, 1892* (S.); Panchur, Johore River, *Ridley, date 1900* (S.).

SINGAPORE: Bidadari, *Ridley, date 1898* (S.); Bukit Timah, *Ridley, date 1891* (S.) and *2112* (S., C., Kew) quoted as *C. Scortechinii;* Seletar, *Ridley, date 1894* (S.); North side of Seletar Reservoir at 11½ mls. Mandai Road, *Sinclair S.F.N. 39246* (S.); Jurong, *Ridley, 22nd May, 1893* (S.); Pulau Ubin, *Ridley, February 1894* (S.).

DISTRIBUTION: Confined to Malaya.

C. Scortechinii King, Mat. F.M.P. Vol. 1 No. 4 (1892) 269 and in Ann. Roy. Bot. Gard. Calc. 4 (1893) 12 Pl. 38 is reduced to a variety by Ridley, F.M.P. (1922) 27. The leaves are supposed to be larger and more obovate, the calyx less deeply cut and the fruit on shorter stalks. The quoted specimens are to be found in the above list. The specimens are hardly different from *C. viridiflorum* and I include them in this species. I have noted that the leaves of *Cyathostemma* even on the same plant are very variable, especially in size.

(3) **C. Hookeri** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 259 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 13 Pl. 40; Ridley, F.M.P. 1 (1922) 28.

Synonym: Uvaria parviflora Hk. f. et Th. Fl. Ind. 1 (1855) 103; Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 51 non *U. parviflora* A. Rich. in Guill. et Perr. Fl. Seneg. Tent. 1, 9 (1830–31) T. 3 Fig. 1.

Climber 10–25 m. high. *Twigs* and leaves glabrous except the very youngest which have some simple and a very few scattered, stellate hairs; older twigs brownish-black with numerous, small lenticels. *Leaves* elliptic or oblong, glossy on both surfaces but darker green above, apex acute, base cuneate or slightly rounded, never emarginate; nerves about 12 pairs, distinct on both surfaces, curving and interarching about 3 mm. from the margin, the line of interarching broken and indistinct; reticulations faint but not raised; length 12–19 cm.; breadth 5·5–8 cm.; petiole 1–1·8 cm. long. *Inflorescence* of 3–4 sub-globose flowers in short cymes opposite the leaves or by growth between them, never axillary, peduncle very short, 1–2 mm. long; pedicels 8 mm.–1 cm. long, sparsely pubescent with a minute, basal and slightly larger median bract (1 mm. long). *Sepals* ovate, acute, sparsely pubescent, free to the base, convex on outside, concave on inside, 3 mm. long. *Petals* waxy-yellow, not expanding but forming a globular flower with a small opening at top, (diameter of opening 3–4 mm.) ovate to rotund, acute, convex outside, concave inside, very shortly pubescent, with a sweet odour, 4–5 mm. long and 4–5 mm. broad, the inner clawed, the outer with a rudimentary claw. *Stamens* numerous, 2 mm. long, yellow, nearly sessile with connectives truncate, slightly produced and incurved. *Ovaries* 4-angled, green, 2–2·5 mm. long with bi-lobed brownish stigma with copious nectar and pubescent at union of stigma and ovary. *Ripe carpels* several, glabrous, oblong to ovoid, slightly tuberculate, 3–4 cm. long and 2 cm. broad, stalks glabrous, 2·5–4·5 cm. long. *Seeds* 5–6 in 2 rows.

PENANG: Government Hill, *Curtis 1213* (S., Kew) type material; Ayer Etam, *Haniff S.F.N. 3678* (S., Kew); *King 1356* (C., D.D.); *1665* and *1666* (C., Kew); 2 sheets Phillips ex Herb. Hookerianum (Kew) type of *Uvaria parviflora.*

PROVINCE WELLESLEY: Krian, *Ridley 9429* (S.).

PERAK: Larut, *King 4047* (C., E., Kew) type material; *6482* (S., C., Kew); Taiping, *King 8526* (C., Kew) type material; Batu Togoh, Taiping, *Wray 2145* (S.) type material.

SINGAPORE: Gardens' Jungle, *Ridley 4790* (S., Kew).

DISTRIBUTION: Borneo.

(4) **C. Wrayi** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 258 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 12 Pl. 39; Ridley, F.M.P. 1 (1922) 27.

Climber 6–20 m. high. *Young twigs* minutely pubescent, becoming glabrous, dark and distinctly striate. *Leaves* of a papery texture, glabrous except for a few hairs on the midrib above, upper surface dull, lower shining, oblong-obovate or broadly oblanceolate, acuminate with acumen 2–3 cm. long, narrowed below to the rounded or emarginate base; nerves 10–14 pairs, curving but not evenly, impressed above, prominent beneath, interarching distinctly about 5 mm. from the margin; reticulations distinct on both surfaces, especially on the lower, forming a very close network but not raised like the main nerves; length 16–29 cm.; breadth 6–10 cm.; petiole 5 mm. long, pubescent. *Inflorescence* cymose on peduncles up to 2 cm. long, (much shorter than in *C. viridiflorum*) arising from tubercles on the older wood or opposite the leaves; pedicels about 1 cm. long with bracts as in *C. Hookeri;* buds globose. *Sepals* ovate, acute, rufous-pubescent outside, glabrous inside, free nearly to the base, 3 mm. long and 4 mm. broad. *Petals* waxy-yellow, coriaceous and slightly warted, not expanding, convex on outer, concave on inner surface, minutely puberulous; outer ovate-orbicular, sub-acute, 8 mm.–1 cm. long and 1 cm. broad, with an incurved base or rudimentary claw; inner narrower with a more distinct claw. *Stamens* sessile, 1·5 mm. long with truncate, slightly incurved connectives. *Ovaries* 2 mm. long, pubescent; stigma U-shaped, split down the inner side. *Ripe carpels* reddish, ovoid, glabrous, 1–1·5 cm. long, thin-walled, stalk slender, about 1 cm. long. *Seeds* 2–3 in 2 rows, (probably more in young ovaries) plano-convex, pale brown, shining.

LOWER SIAM: Sapli Limestone Hill, *Haniff* and *Nur S.F.N. 4269* (S., Kew).

PENANG: Path behind Waterfall Road leading to quarry next Waterfall Gardens, *Sinclair S.F.N. 39341* (S., Kew).

PERAK: *Scortechini 131 b* (S., C., Kew) type material; Larut, *King 4207* (S., C.) type material; Waterfall, Taiping, *Wray 3283* (S., C.) type material; Dengong, Telok Anson, *Haniff S.F.N. 14189* (S., Kew); Gopeng, *King 4635* (Kew) type material.

PAHANG: Kuala Tembeling, *Mat, date 1893* (S.); Dong near Raub, *Burkill and Haniff S.F.N. 16917* (S.); Kuala Tembeling, *Henderson, July, 1929* (S.); Gali near Raub, *Burkill* and *Haniff S.F.N. 16218* (S.).

SELANGOR: Weld Hill Reserve, *Hashim C.F. Field No. 4936* (S., K., Kew); Bukit Tarik Reserve, *Yeob 5128* (K.); Jackson's Estate, Gua Batu, *Ridley, December 1890* (S.); Sungei Buloh, *Ridley, 14th December, 1920* (Kew).

DISTRIBUTION: Confined to the Malay Peninsula.

Differs from *C. viridiflorum* in the shorter peduncles and the fine reticulations of the leaves and resembles *C. micranthum* in the ripe carpels with thin walls and slender pedicels.

(5) **C. micranthum** (A. DC.) J. Sinclair, **comb. nov.**

Basonym: Guatteria micrantha A. DC., Mém. Anon. (1832) 42.

Synonyms: Uvaria micrantha Hk. f. et Th., Fl. Ind. 1 (1855) 103; Hk. f. et. Th. in Fl. Br. Ind. 1 (1872) 51; Kurz, For. Fl. Br. Burma 1 (1877) 29; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 270 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 26 Pl. 18; Ridley, F.M.P. 1 (1922) 33; Craib, Fl. Siam. Enum. 1 (1925) 30. *U. sumatrana* Kurz, Andam. Report (1870) 29. *Anaxagorea sumatrana* Miq. Fl. Ind. Bat. Suppl. (1861) 382. *Cyathostemma sumatrana* Boerl. in Icon. Bogor. 1 Fasc. 3 (1899) 171 T. 58. *Polyalthia fruticans* A.DC. Mém. Anon. (1832) 42. *Popowia nitida* King, Mat. F.M.P. Vol. 1 No. 4 (1892) 341 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 118 Pl. 165 B.

Climber. *Young branches* at first rusty-brown-tomentose, afterwards glabrous, finely striate, dark coloured and with pale lenticels. *Leaves* thinly coriaceous, oblong-lanceolate, acuminate or acute, base shortly cuneate or rounded, glabrous except the midrib which is rufous-pubescent above and sometimes sparsely pubescent beneath; nerves 10–15 pairs, curving often irregularly, faint on both surfaces. sometimes scarcely distinguishable among the faint reticulations, interarching near margin; length 6–14 cm.; breadth 2–3·5 cm.; petiole 3 mm. long. *Inflorescence* a 2–5-flowered cyme, opposite the leaves or terminal; pedicels 6 mm. long, rusty-brown-tomentose with a basal and a medial, clasping, orbicular bract; flower buds globose, apiculate, not appearing to expand completely (only a small opening at the top). *Sepals* sub-rotund, obtuse, pubescent outside, glabrous inside, 2–2·5 mm. long. *Petals* 3 mm. by 3 mm., greenish-yellow, tomentose, broadly ovate, sub-obtuse, convex outside, concave inside, the inner slightly clawed, the outer with a rudimentary claw. *Stamens* numerous, 1 mm. long with truncate appendages. *Ovaries* pubescent, 1 mm. long with stigma bilobed and split on the inner side. *Ripe carpels* about 1 cm. in diam., numerous, glabrous, globose or with irregular bulges due to the seeds; stalks slender, glabrous, 2–2·5 cm. long. *Seeds* 2–7 in 2 rows, plano-convex, smooth, medium brown.

LOWER SIAM: Pulau Terutau, *Haniff S.F.N. 1068* (S., Kew).

KEDAH: Pulau Langkawi, *Curtis 2808* (S., Kew); *s.n., September 1890* (S.).

PENANG: Bukit Erskine, *Curtis 3015* (S., Kew); Telok Bahang, *Curtis 3505* (S., Kew); *Wall. Cat. 6474 B Porter* (C., Kew).

PERAK: Tea Gardens, Taiping, *Ridley 2984* (S., C.) quoted by King in Ann. Roy. Bot. Gard. Calc. as *Popowia nitida;* Lubok Merbok, Kuala Kangsar, *Haniff S.F.N. 16010* (S.).

PAHANG: Jerantut, *Burkill* and *Haniff S.F.N. 16075* (S., K.); Kuala Tembeling, *Burkill* and *Haniff S.F.N. 15840* (S.).

MALACCA: *Maingay 29* (C., Kew).

JOHORE: Muar, *Curtis s.n., April 1901.*

DISTRIBUTION: Burma, Siam, Malay Islands to New Guinea.

The flowers of this species so closely resemble those of *Cyathostemma Hookeri* and *C. viridiflorum* that I have removed it from *Uvaria* and placed it in the above genus. The globose flower buds, the shape of the petals and the fact that they do not appear to expand, all suggest that it is a *Cyathostemma.* However I do not think the genus is very far removed from *Uvaria.* Boerlage has also placed this species in *Cyathostemma.*

(6) **C. excelsum** (Hk. f. et Th.) J. Sinclair, **comb. nov.**

Basonym: Mitrephora excelsa Hk. f. et Th., Fl. Ind. 1 (1855) 114; Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 77; Miq. Fl. Ind. Bat. 1 pt. 1 (1858) 31.

Synonyms: Uvaria excelsa Wall. Cat. *6477 (1832)* nom. nud.; King, Mat. F.M.P. 4 (1892) 271 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 30 Pl. 26; Ridley, F.M.P. 1 (1922) 34. *Uvaria confertiflora* Merr. in Univ. Calif. Pub. Bot. 15 (1929) 61.

Woody climber 10–30 m. high. *Young twigs* brown-pubescent, later becoming glabrous and black, striations well marked. *Leaves* coriaceous, oblong-obovate, acute, slightly narrowed to the emarginate or slightly cordate base, shining, glabrous above except for the pubescent, sunk midrib, greyish when dry, beneath stellate-brownish-pubescent, the degree of pubescence varying with age; nerves 8–11 pairs, curving and ascending rather crookedly, prominent beneath, reticulations forming a close network, visible on both surfaces, especially on the lower; length 9–22 cm., average 16 cm.; breadth 4–10 cm., average 6 cm.; petiole 4–5 mm. long, pubescent. *Inflorescence* of clustered cymes on the older twigs below the leaves; pedicels about 5 mm. long with one tomentose clasping bract below the middle or medial and several at the base of the cyme, probably one to each flower; buds globose, not expanding in flower, the maximum opening 5 mm. across. *Sepals* 4 mm. long and 6 mm. broad, semi-orbicular, sub-acute, coriaceous, brown-tomentose on both surfaces but less so on the inner. *Petals* 5–6 mm. long and 5–6 mm. broad, the inner slightly narrower, broadly ovate, acute, whitish, imbricate at the tips, tomentose like the sepals, convex on outside, concave on inside, the inner slightly clawed. *Stamens* 2–2·5 mm. long with oblique, slightly incurved

tomentose connectives. *Ovaries* 3 mm. long, stellate-pubescent with bilobed stigmas. *Ripe carpels* sub-globose, densely stellate-tawny-tomentose, tuberculate, 2–2·6 cm. long and 2–2·3 cm. in diam.; stalks with similar tomentum, stout, about 3 cm. long. *Seeds* several (about 14) in 2 rows, nearly oval, flat, smooth, brown.

PENANG: Government Hill, *Curtis 50* (S., C., Kew) and *1059* (S., C.) and *1443* (S., C.); *Wall Cat. 6477* (Kew) type material; *King 5210* (C., E., Kew) *Maingay 36* (Kew).

PERAK: *Scortechini 1540* (S., C.); *121b* (C.); *King 8131* (C.); *8777* (C.); *1476* (C.); Larut, Perak, *5981* (C., D.D., Kew); *5451* (C., Kew).

PAHANG: Sg. Bilut For. Res., Raub, *Osman 28429* (K.).

SELANGOR: Petaling, *Ridley 10203* (S.); Damansara Road, Kuala Lumpur, *Ridley, December 1920* (S., Kew).

SINGAPORE: No data (S.).

DISTRIBUTION: Borneo.

King and Ridley both state that this plant does not have the typical flower of a *Uvaria* in that the petals are imbricate at the tips. Hooker f. and Thomson are also doubtful of the correct genus and although they put it in *Mitrephora* with a query, they suggest *Uvaria.* The globose flower buds not expanding, the imbricate petals, together with the bi-lobed stigma and general characters all suggest that this plant is a *Cyathostemma,* if that genus is to be maintained distinct from *Uvaria.*

(7) **C. acuminatum** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 259 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 13 Pl. 41; Ridley, F.M.P. 1 (1922) 28.

Climber. *Branches* pale brownish, the youngest slender, dark-coloured, rufous-puberulous. *Leaves* membranous, oblanceolate to oblong, caudate-acuminate, base acute, both surfaces glabrous, shining and minutely reticulate; midrib depressed above and puberulous, prominent beneath; nerves 10–11 pairs, spreading, curved, depressed above, prominent beneath; length 20–23 cm.; breadth 5·5–6·5 cm.; petiole 4 mm. long, tomentose. *Cymes of hermaphrodite flowers* 10–15 cm. long; pedicel about as long as the branches, the latter with numerous distichous, oblong, nervose bracts. *Flowers* 1–1·3 cm. in diam. on short pedicels. *Sepals* triangular, blunt, spreading. *Petals* as in *C. Scortechinii;* connective of stamen forming a thick incurving point at the apex. *Ovaries* as in *C. Scortechinii* but with conical stigmas. *Cymes* of female *flowers* much shorter than those of the hermaphrodite, dichotomous, few-flowered, about 3·8 cm. long (of which peduncle is 2·5 cm. long), bracts few, lanceolate. *Flowers* about 1 cm. in diam.

when open; buds conical. *Sepals* broadly triangular, cordate, acute, spreading, pubescent. *Petals* coriaceous, granular-pubescent, concave; the outer broadly ovate-triangular, the apex sub-acute, incurved in the bud; the inner row smaller, narrower, erect, connivent. *Stamens* absent. *Ovaries* as in the hermaphrodite, but the stigma larger and not conical.

TYPE: Upper Perak, *Wray 3468*.

Of this species there are no specimens in the Singapore Herbarium or Kew and I have not seen *Wray 3468*. The description given is taken from King, and from it and the plate, the genus is certainly *Cyathostemma*. The leaves in the plate are very similar to those of *C. Wrayi* and also the detached fruit. However the presence of two kinds of flowers is unique. It would be useful to see more and fresh material of *C. Wrayi* and study its variations. The leaves of *C. Wrayi* are extremely variable on the same plant.

8. RAUWENHOFFIA Scheff. in Ann. Jard. Buitenz. 2 (1885) 21; Boerl. in Icon. Bog. 1, fasc. 2 (1899) 197 T. 70; Diels in Engl. Bot. Jahrb. 49 (1912) 124; Airy-Shaw in Kew Bull. (1939) 279.

Scandent shrubs. *Leaves* with stellate hairs. *Flowers* opposite the leaves, extra-axillary. *Sepals* 3, valvate, united at the base. *Petals* 6 in 2 series, imbricate, the outer flat, the inner slightly smaller with a narrow claw. *Stamens* as in *Uvaria* with convex connectives. *Ovaries* as in *Uvaria* with funnel-shaped stigma having an opening on the inner side and a groove continuing down ovary from the opening; style absent. *Seeds* several in 2 rows.

TYPES OF THE GENUS: *R. siamensis* Scheff. in Ann. Jard. Buitenz. 2 (1885) 23 and *R. Leichhardtii* (Muel.) Diels in Journ. Arn. Arbor. 20 (1939) 74 = [*R. uvarioides* Scheff. in Ann. Jard. Buitenz. 2 (1885) 23].

DISTRIBUTION: Siam, Indo-China, Malaya, New Guinea. 5 species.

(1) **R. siamensis** Scheff. in Ann. Jard. Buitenz. 2 (1885) 21; Boerl. in Icon. Bog. 1, fasc. 2 (1899) 197 Tab. 70; Ridley, F.M.P. 1 (1922) 89; Craib, Fl. Siam. Enum. (1925) 45; Ast in Fl. Gén. de L'Indo-Chine Suppl. 1 (1938) 104.

Synonyms: Uvaria Godefroyana Finet et Gagnep. in Bull. Soc. Bot. Fr. Mém. 4 (1906) 71 T. 12A; Fl. Gén. de L'Indo-Chine 1 (1907) 55 Pl. 7. *Melodorum Schefferi* Pierre ex Finet et Gagnep. in Bull. Soc. Bot. in Fr. Mém. 4 (1906) 134 T. 19A; Fl. Gén. de L'Indo-Chine 1 (1907) 99.

Scandent shrub. *Young twigs* brown-pubescent, later striate and with numerous pink lenticels. *Leaves* coriaceous oblong to oblong-lanceolate, bluntly acute with rounded emarginate base, shining and glabrous above, except for the sunk midrib when young, lower surface slightly pubescent with stellate hairs, becoming glabrous; nerves about 10 pairs opposite or alternate, secondaries also present, faint or indistinct above, faint below; reticulations very faint and close; length 8–22 cm.; breadth 2·5–5 cm.; petiole 5 mm. long, pubescent. *Flowers* solitary, opposite the leaves on pubescent, 1 cm. long pedicels with a small clasping, pubescent, obtuse bract 2 mm. long at the base or below the middle. *Sepals* coriaceous, minutely brown-pubescent, connate at the very base, ovate-orbicular, obtuse, 5 mm. long and 4 mm. broad. *Petals* yellowish, coriaceous, minutely tomentose on both surfaces except at base inside, outer 1 cm. long and 8 mm. broad; inner 8 mm. long, narrower and shortly clawed at base. *Stamens* 2 mm. long, numerous, with convex connectives and very short filaments. *Ovaries* 3–4 mm. long, brown-stellate-tomentose, linear-oblong, slightly curved, stigma large, funnel-shaped with split down the inner side. *Ripe carpels* about 6, cylindric, obtuse with a small apiculus, minutely brown-stellate-pubescent, transversely furrowed, 1–2 cm. long and 8 mm.–1 cm. in diam.; stalks 5 mm. long, stellate-pubescent. *Seeds* 5–7 in 2 rows, flat on one side, convex on the other, brown, shining, 7 mm. long and 4 mm. wide.

LOWER SIAM: Pak Raw, *Annandale S.F.N. 1600* (S., Kew); Sapli, *Haniff* and *Nur S.F.N. 4265* (S.).

KELANTAN: Kampong Kota Bahru, *Ridley, February 1917* (S., Kew); Kota Bahru, *Corner, 24th April, 1937* (S.).

PERAK: Grik, *Burkill* and *Haniff S.F.N. 12339* (S.).

PAHANG: Ulu Rompin, *Yeob C.F. 3185* (S., K., Kew).

DISTRIBUTION: Siam, Malaya and Indo-China. Type, *Pierre 1788*. Indo-China in Herb. Kew (*Unona Schefferi*).

It is rather surprising that Scheffer who created this genus placed it next to *Fissistigma* (*Melodorum*). King, Ridley and others follow him without comment placing it next to *Melodorum* in the *Xylopieae*. Finet and Gagnepain, Diels and Airy-Shaw have correctly placed it in the *Uvarieae*.

The genus is extremely close to *Uvaria* the only difference being that the inner petals have narrow claws while they do not in *Uvaria*. The petals are imbricate at the tips and not valvate as the majority of authors state. They were probably misled by this fact and did not examine the aestivation. It seems hardly worth while maintaining *Rauwenhoffia* as a genus distinct from *Uvaria* since there is only the one difference. However this is a small point and I leave it as *Rauwenhoffia*.

9. ELLIPEIA Hk. f. et Th. Ind. 1 (1855) 104.

Climbers. *Inflorescence* a terminal panicle. *Sepals* 3, valvate. *Petals* 6 in 2 series, imbricate, the outer larger than the inner, the inner not much larger than the sepals. *Stamens* many, connectives oblique, peltate, slightly produced. *Ovaries* numerous with a rather elongate style. *Carpels* 1-seeded with lateral apiculus, the seed ventral, attached slightly above the middle.

TYPE OF GENUS: *E. cuneifolia* Hk. f. et Th. Fl. Ind. 1 (1855) 104.
DISTRIBUTION: Malaya, Borneo, Sumatra. Species about 5, some of them imperfectly known.

A genus related to *Uvaria* but differing in the single ovule attached ventrally above the middle of the carpel and in the inner petals being much shorter than the outer. A few species later described under this genus by Hk. f. et Th. and by King have been removed to *Trivalvaria* and *Uvaria* as they do not in the least agree with the characters of this genus as typified by the original species *E. cuneifolia.*

E. cuneifolia Hk. f. et Th. Fl. Ind. 1 (1855) 104; Hk. Icones Plant. (1867) T. 1025; Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 52; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 274 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 32 Pl. 29; Boerlage in Icon. Bog. 1 (1899) 97; Ridley, F.M.P. 1 (1922) 35.

Climber 30–50 m. high. *Young twigs* rusty-tomentose, soon glabrous and striate. *Leaves* thinly coriaceous, glossy and glabrous above except on the sunk midrib, very shortly and closely buff-stellate-tomentose below, tending to become sub-glabrous with age, narrowly obovate-oblong, apex rounded, abruptly and shortly acuminate, base rounded and emarginate, sometimes slightly unequal-sided; nerves 15–19 pairs, rather straight, impressed above, prominent beneath, line of interarching broken and faint; reticulations faint above, more distinct below; length 12–20 cm., average 13 cm.; breadth 4·5–7·5 cm.; petiole 4–7 mm. long, tomentose. *Inflorescence* terminal, ultimately cymose in a much branched short panicle with a basal and a median clasping, obtuse, tomentose bract to each flower; pedicels about 1·5 cm. long. *Sepals* ovate-triangular, nearly obtuse, coriaceous, brown-tomentose outside and inside, 5 mm. long. *Petals* yellow, fleshy, connivent, outer 1·5–2 cm. long, tomentose on both surfaces except at the base inside, oblong-rotund, very obtuse, inner similar in tomentum but much smaller, about 7 mm. long. *Stamens* 2 mm. long with oblique, peltate slightly-produced connectives. *Ovaries* oblong, 2 mm. long, pubescent with a slightly elongated style and capitate stigma. *Torus* small, sub-globose. *Ripe carpels* oval,

obtuse at both ends with a lateral apiculus, very shortly brown-tomentose, about 2 cm. long; stalks 1·5 cm. long. *Seed* one, dark brown, ventral, attached above the middle of the carpel and filling it.

PERAK: Gopeng, Larut, *King 6045* (S., C.); *5319* (S., C.); *7825* (C., D.D.); *4054* (C., D.D.); *4623* (C., E.); *5844* (C., E.); Perak, *10293* and *7868* (C., D.D.); Maxwell's Hill, *Wray 642* (C.); Tapah, *1339* (S., C., E.); Relau Tujor, *2888* (S., C.).

SELANGOR: Gap, *Curtis 3760* (S.).

MALACCA: *Maingay 31* (C.); *Griffith, s.n.* type collection (C., D.D., E.); Jasin Road, *Ridley, 15th June, 1892* (S.).

SINGAPORE: Reservoir Woods, *Ridley 5082* (S., D.D.); Gardens' Jungle, *Ridley 4919* (S.).

DISTRIBUTION: Borneo.

Tribe 2. UNONEAE

Petals valvate or open in bud, both sets similar or sub-similar, equal or sub-equal, spreading in flower or the apices free; outer flat or concave at base only; the inner flat, terete or filiform, concave or not at the base. *Stamens* many, connectives flat-topped, or convex, rarely apiculate (*Cananga*), the anther cells concealed by the connectives.

KEY TO THE GENERA OF THE UNONEAE

a. Petals spreading above, often constricted at junction of blade and claw; claws orbicular, concave, conniving and closely pressed over the sexual organs; blades linear or filiform, oblong, flat or terete; the three inner petals separating at base but falling as one piece

b. Trees with extra-axillary decurrent peduncles bearing the pedicels; carpels 1 or several, ovules several in two rows **10. Cyathocalyx**

b. Climbers with extra-axillary decurrent hooked woody peduncles (rarely spines), bearing the pedicels; carpels few to many, ovules 2, erect, collateral **11. Artabotrys**

a. Petals flat, more or less spreading from the base (adhering by the edges in *Desmos* section *Dasymaschalon*) not constricted above the claw and not closely pressed over the sexual organs; the inner three not adhering in one piece when they fall

c. Flowers trimerous, sepals 3, petals 3 + 3

d. Carpels more than one; anthers dorsal, extrorse

e. Fruit moniliform with several seeds in a single row **12. Desmos**

e. Fruit not moniliform

f. Carpels hard and thick-walled, 5–7 mm. thick, (2 mm. only in *Oncodostigma*) sessile or sub-sessile; stigma disc-shaped or pileate, lobed

g. Flowers extra-axillary, petals obovate, obtuse (carpels 3 sometimes 1) **13. Monocarpia**

g. Flowers axillary, petals gradually tapering to an acute apex from a broad base

h. Petals with thick edges; nerves of leaf faint, not prominent, not straight, secondary nerves present; seeds 3–5 **14. Oncodostigma**

h. Petals not thick at edges; nerves of leaf prominent, straight, oblique, no secondary nerves; seeds 8–10 **15. Meiogyne**

f. Carpels thin-walled about 1 mm. thick when dry and not so hard, mostly stalked but sometimes sessile; stigmas globose, rectangular or irregularly shaped

i. Stamen connectives flat-topped or convex; flowers axillary, extra-axillary or tubercled on woody out-growths of the trunk, scented or not; seeds 1–5, usually 1–2 **16. Polyalthia**

i. Stamen connectives apiculate, erect; flowers axillary, strongly scented; seeds 2–12 usually more than 5 in two rows **17. Cananga**

d. Carpels 1; anthers ventral, introrse; flowers in axillary fascicles (Carpels sometimes 1 in *Monocarpia* but anthers dorsal and flowers extra-axillary) **18. Mezzettia**

c. Flowers dimerous usually 2 sepals and 4 petals but often not constant, e.g. sepals 2–3, petals 2, 3, 4, 5, 6, 7 or 8

j. Mountain plants; flowers terminal, petals united at base or free; carpels 1–2-seeded, stalked, thin-walled, numerous, not moniliform **19. Disepalum**

j. Not mountain plants; flowers axillary, petals 2–3 adhering by edges; carpels moniliform with seeds in a single row **12. Desmos** section **Dasymaschalon**

10. CYATHOCALYX Champion in Hk. f. et Th. Fl. Ind. 1 (1855) 127 including *Drepananthus* Maingay ex Hk. f. et Th. Fl. Br. Ind. 1 (1872) 56.

Monopodial trees with mast-like trunks and a crown of branches near top. *Leaves* two-ranked. *Flowers* extra-axillary, usually opposite the leaves, fragrant. *Peduncles* decurrent. *Sepals* valvate, free or united into a 3-lobed cup. *Petals* 6, valvate, in two series, sub-equal, the claws orbicular, concave, conniving and closely pressed over the sexual organs, the inner three petals not separating when they fall, slightly constricted or bent at the junction of the blade; blades linear, filiform, oblong, flat or terete. *Stamens* indefinite, the connectives flat-topped, concealing the anther cells, filament short. *Ovaries* 1—several, oblong or cylindric, stigmas discoid, peltate, pileate and lamellate, convex, often agglutinated; ovules several in two rows. *Ripe carpels* large or small, sessile or shortly stalked.

TYPE OF GENUS: *C. zeylanicus* Champion in Hk. f. et Th. Fl. Ind. 1 (1855) 127.

DISTRIBUTION: India, South-East Asia, New Guinea and Philippines. Species about 38.

Section Eucyathocalyx Scheffer in Ann. Jard. Bot. Buit. 2 (1881) 6.

Midrib and *nerves* raised or flush with upper surface of leaf as in *Artabotrys,* the midrib rather broad at the base. *Leaves* glabrous or pubescent. *Ovary* 1, glabrous.

Section Drepananthus Scheffer in Ann. Jard. Bot. Buit. 2 (1881) 6.

Midrib and *nerves* on the upper surface of leaf always sunk. *Leaves* tomentose, pubescent, puberulous or entirely glabrous beneath. Stellate and simple hairs present in the non-glabrous species. *Ovaries* 2 to several, pubescent with sericeous hairs.

There are two syntypes of *Drepananthus* viz. *pruniferus* and *ramuliflorus* Fl. Br. Ind. 1 (1872) 56.

I agree with Scheffer, Ann. Jard. Bot. Buit. 2 (1881) 6 and Boerlage, Icon. Bogor. 1 (1899) 114 that *Drepananthus* should be united with *Cyathocalyx*. I have examined a large number of flowers from both genera and in all cases their position and structure is so uniform that I cannot feel they are different.

The differences that do exist (1) the single carpel and (2) the midrib and nerves raised or flush with the upper surface of the leaf, found in *Eucyathocalyx,* seem rather trivial and not sufficient to permit separation into two distinct genera.

The species which fall into the section *Eucyathocalyx* are fewer than in the other section, *C. sumatranus* being the only one found in Malaya.

There is a very close resemblance to *Artabotrys* especially in the flower with the petals closely pressed over the sexual organs. Both have fragrant flowers. The decurrent, sometimes slightly bent peduncle of *Cyathocalyx* suggests an incipient hook. Hooked peduncles are usual in *Artabotrys* but there are some species in which the hook at the end of the peduncle is very much reduced or absent, e.g. *A. speciosus*.

The leaf in *Artabotrys* has the upper midrib raised and is very similar to that of the *Cyathocalyx* species in the *Eucyathocalyx* section. The growth habit is different however. *Artabotrys* species are climbers, not trees. Also their ovules are reduced to two.

KEY

Section *Eucyathocalyx*

a. Midrib and nerves raised or flush with upper surface of leaf. Carpel 1 (1) **C. sumatranus**

Section *Drepananthus*

a. Midrib and nerves sunk on upper surface. Carpels 2-several

b. Petals filiform, 7–10 cm. long (2) **C. Ridleyi**

b. Petals filiform, linear or oblong but less than 7 cm. long

c. Blade of outer petals 7 mm.–1 cm. wide

d. Pedicels 2 cm. long; sepals 2 cm. long; ripe carpels sessile (3) **C. pruniferus**

d. Pedicels 5 mm. long, sepals 8–9 mm. long; ripe carpels with stalks 4 mm. long (4) **C. pahangensis**

c. Blade of outer petals narrow, linear or filiform 1–4 mm. wide

e. Sepals broadly orbicular, obtuse (5) **C. carinatus**

e. Sepals ovate, acute

f. Carpels 2. Leaves glabrous (6) **C. olivaceus**

f. Carpels more than 2

g. Peduncles sessile on minute, woody tubercles; flowers densely clustered on the older branches; petals 1·3–1·5 cm. long; carpels sessile; leaves tomentose (7) **C. ramuliflorus**

g. Peduncles 5 mm. long, flowers nearer the tips of the branches; petals 3–5 cm. long; carpels stalked; leaves glabrous or puberulous beneath (8) **C. Scortechinii**

KEY No. 2

Section *Eucyathocalyx*

a. Midrib and nerves raised or flush with upper surface of leaf. Carpel 1 (1) **C. sumatranus**

Section *Drepananthus*

a. Midrib and nerves sunk on upper surface of leaf. Carpels 2-several

b. Leaves tomentose beneath (sometimes nearly glabrous except on veins in *C. pruniferus*)

c. Base of leaf rounded, sub-cordate or unequal-sided

d. Flowers in dense clusters on older wood; blade of outer petals 2 mm. wide. Carpels rusty-pubescent (7) **C. ramuliflorus**

d. Flowers on the tips of the branches; blade of outer petals 7 mm. wide. Carpels glabrous (3) **C. pruniferus**

c. Base of leaf cuneate

e. Sepals ovate, acute; petals filiform 7–10 cm. long (2) **C. Ridleyi**

e. Sepals broadly orbicular, obtuse; petals linear, flat, 2–3 cm. long (5) **C. carinatus**

b. Leaves pubescent, puberulous or glabrous beneath

f. Leaves scabrid-pubescent beneath, nerves curving, reticulations prominent beneath; petals 2–3 cm. long, blade 1 cm. wide (4) **C. pahangensis**

f. Leaves puberulous on nerves, becoming glabrous, nerves very straight, reticulations rather faint beneath; petals 3–5 cm. long, blade 1 mm. wide (8) **C. Scortechinii**

f. Leaves entirely glabrous, nerves 6–8 pairs, boldly curving, reticulations not visible beneath; petals 3·5–4 cm. long, blade 3 mm. wide (6) **C. olivaceus**

(1) **C. sumatranus** Scheff. in Nat. Tijdschr. Nederl. Ind., ser. 7, vol. 2 (1873) 388.

Synonym: Xylopia Curtisii King, Mat. F.M.P. Vol. 1 No. 4 (1892) 365 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 147 Pl. 192A; Ridley, F.M.P. 1 (1922) 90. Including *X. tembelingensis* Henderson in Gard. Bull. Str. Settl. 7 (1933) 89 Pl. 16.

Tree 10–23 m. high with a crown of spreading branches at top. *Twigs* stout and striate bearing leaves in two ranks. *Leaves* coriaceous, oblong to oblong-lanceolate, glabrous and shining above, lower surface dull, covered with a very short mealy pubescence which rubs off easily and is eventually shed, apex acute, base cuneate, midrib above flush with surface of leaf and very broad at base, 2–2·5 mm. broad, much narrower at apex; raised beneath, nerves about 20 pairs, straight and oblique, prominent on both surfaces especially on the lower; reticulations transverse; length 14–28 cm.; breadth 5–7·5 cm.; petiole 1 cm. long, stout, channelled. *Flowers* 2–3, extra-axillary on stout, woody, decurrent peduncles, slightly fragrant. *Pedicels* rusty-pubescent, 3–5 mm. long with an amplexicaul basal bract. *Sepals* about 1 cm. long, broadly ovate, acute, tomentose on both surfaces, connate at base, reflexed. *Petals* tomentose, greenish with pale pink, glabrous claws, the claw orbicular, pressed over the sexual organs, sub-equal, 3–5·6 cm. long, length depending on age, 7–9 mm. broad, strap-shaped, obtuse, keeled outside. *Stamens* numerous, 1–2 mm. long with flat-topped or oblique connectives concealing the anther cells. *Ovary* single, cylindric, fluted, about 3 mm. long with a disc-like, pileate stigma. *Ripe carpel* ovoid, sessile, with many seeds in two rows, surface dull, wall thick and stony, 7·5 cm. long and 6·5 cm. in diam.

KELANTAN: Bukit Bubong, *Mohamed 33306* (K.).

PENANG: Waterfall, *Curtis 1569* (S., C., Kew) type material; *Nur S.F.N. 7571* (S., C., Kew), cultivated in Botanic Gardens.

PERAK: *Scortechini,* no details (S.).

PAHANG: Tembeling, *Henderson S.F.N. 24533* (as type of *tembelingensis* (S., D.D., Kew); Kemansul F.R., *Symington 49834* (K.); Bukit Beserah F.R., Kuantan, *Abdul Majid 31867* (K.).

SINGAPORE: Liane Road, Botanic Gardens' Jungle. One tree still here at time of writing. Gardens' Herb., *Corner 5th September, 1943* (S.).

DISTRIBUTION: Confined to Malaya.

This species belongs to the Section *Eucyathocalyx,* i.e. those species having a large single carpel and the non-grooved, flat midrib flush with the upper surface of the leaf. It is nearer to *C. martabanicus* than to *C. zeylanicus* the type of the genus. Both differ from *C. zeylanicus* in the deeply divided calyx.

On comparing *C. martabanicus* and *C. sumatranus,* the leaves of *C. martabanicus* are wider at the middle and have about 12 pairs of curving nerves while those of *C. sumatranus* have about 20 pairs of much straighter nerves which are more closely spaced. The petals in *C. martabanicus* are more fleshy and the fruit is more elongate and not ovoid.

Two other species with one carpel fall in this section. *C. globosus* from the Philippines and *C. annamensis* from Annam, Indo-China. I am unable to separate *tembelingensis* from *sumatranus.*

(2) **C. Ridleyi** (King) J. Sinclair, **comb. nov.**

Basonym: Xylopia Ridleyi King, Mat. F.M.P. Vol. 1 No. 4 (1892) 370 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 152 Pl. 199; Ridley, F.M.P. 1 (1922) 95.

Small tree with pole-like trunk and crown of branches at top. *Young twigs* densely rusty-tomentose. *Leaves* in two ranks, coriaceous, dark green above, paler beneath, obovate-elliptic, apex abruptly and very shortly cuneate; base cuneate, occasionally rounded, upper surface glabrous except for the sunk midrib and nerves, lower softly rusty-tomentose with stellate and simple hairs; nerves 12–14 pairs, prominent below, oblique, interarching near margin; reticulations parallel to each other and at right angles to main nerves, often obscured by the tomentum; length 15–25 cm.; breadth 7·5–9·5 cm.; petiole 1·5–2 cm. long; tomentose. *Flowers* extra-axillary, usually opposite the leaves, fragrant like *Cananga. Peduncles* decurrent, about 5–7 mm. long bearing several tomentose pedicels, 6–8 mm. long. *Sepals* free to the base, rusty-pubescent outside, glabrous inside, ovate, acute, 8 mm. long. *Petals* 10–10·5 cm. long, sub-equal, blade filiform, 1 mm. wide, pubescent, greenish-yellow, pink at base, the orbicular claws pressed closely over the stamens. *Stamens* numerous, 2 mm. long with flat-topped connectives. *Ovaries* obliquely ovoid, densely sericeous, 4–5 mm. long; stigmas agglutinated, pileate, slightly elongated. *Ripe carpels* 6–10, cylindric, obtuse with a glaucous, waxy bloom, sparsely rusty-pubescent, slightly constricted between the seeds, the constrictions seen to advantage in the dried carpels when they undergo shrinkage; a faint furrow running down the inner side of the fruit; length 2–3 cm.; br. 1·3–1·5 cm.; stalks pubescent, 5 mm. long with several minute furrows. *Seeds* 2–7, testa smooth, shining, nearly circular, flattened on both sides. **Fig. 10.**

PAHANG: Tasek Bera, *Henderson S.F.N. 24148* (S., K.).

JOHORE: Ulu Kahang, *Holttum S.F.N. 10852* (S.); Sungei Kahang, *Watson 5868* (S., K., Kew); 5½ mile Kota Tinggi-Mawai Road, *Corner S.F.N. 21317* (S., K., Kew).

SINGAPORE: Bukit Timah Forest Reserve, *Sinclair S.F.N. 38449* (S., E.) and *37930* (S., E.); *Ngadiman S.F.N. 37013* (S., K., Kew); *Ridley 3466* (S.) type material; Changi, *Ridley 4711* (S., C., Kew) type material; north-east end of MacRitchie Reservoir, *Sinclair S.F.N. 37929* (S.); *Cantley 127* (Kew).

DISTRIBUTION: Borneo.

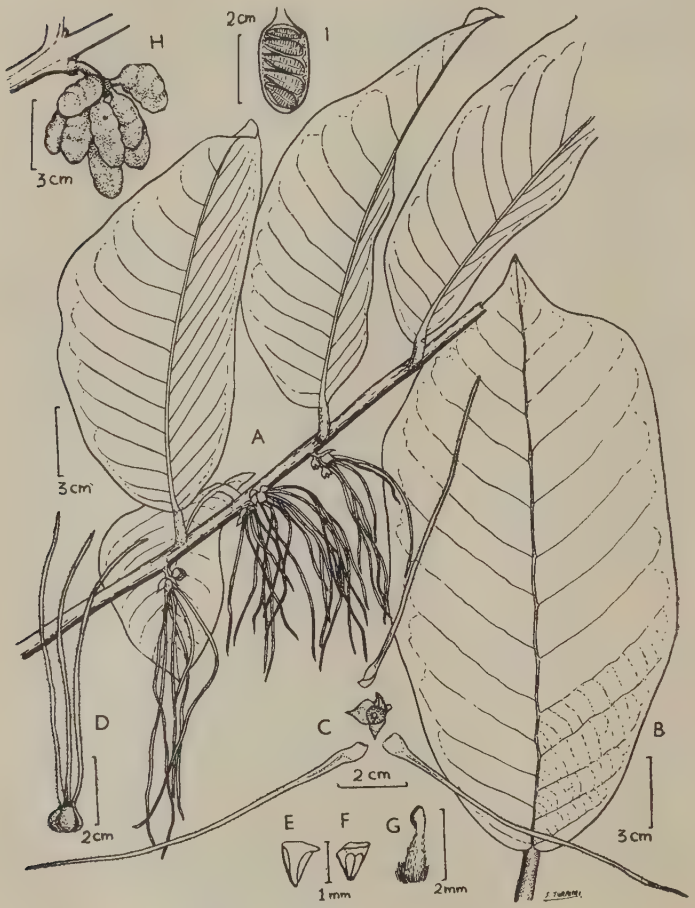


Fig. 10. *Cyathocalyx Ridleyi* (King) J. Sinclair.

A, Flowering twig. B, Leaf. C, Sepals and outer petals. D, Inner petals. E, Stamen, back view. F, Stamen, front view. G, Gynoecium. H, Fruit. I, Carpel, longitudinal section.

This species resembles *C. apoensis* (Elmer) J. Sinclair, comb. nov. and *C. philippinensis* (Merr.) J. Sinclair, comb. nov. in the stalked, constricted fruits and hairy leaves. (New combinations made here.) It resembles the glabrous leaved *C. Havilandii* Boerl. in having long narrow filiform petals. *C. Scortechinii* also has stalked fruits but the leaves are glabrous or nearly so. The petals are also linear to filiform but not quite so long.

Cyathocalyx apoensis (Elmer) J. Sinclair, **comb. nov.**

Basonym: Drepananthus apoensis Elmer, Leafl. Philip. Bot. 5 (1913) 1708.

Cyathocalyx philippinensis (Merr.) J. Sinclair, **comb. nov.**

Basonym: Drepananthus philippinensis Merr. in Philip. Journ. Sc. Bot. 3 (1908) 137.

(3) **C. pruniferus** (Maingay ex Hk. f. et Th.) J. Sinclair, **comb. nov.**

Basonym: Drepananthus pruniferus Maingay ex Hk. f. et Th. Fl. Br. Ind. 1 (1872) 56; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 287 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 48 Pl. 65; Ridley, F.M.P. 1 (1922) 37; Corner, Wayside Trees of Malaya 1 (1940) 133 Text-Fig. 34.

Monopodial tree 13–23 m. high with a crown of horizontal or spreading branches. *Young twigs* chocolate-brown-tomentose. *Leaves* coriaceous, two-ranked, elliptic to elliptic-oblong, apex rounded and blunt or slightly acute, base sub-cordate and unequal-sided, the upper surface glabrous except the veins and sunk mid-rib, the lower occasionally glabrous, mostly shortly rusty-stellate-pubescent; nerves 17–19 pairs, straight, nearly parallel and oblique as in *C. Scortechinii* with similar reticulations; size variable, length 15–40 cm.; breadth 9–15 cm.; petiole stout, channelled, 1·7–2·5 cm. long. *Flowers* in extra-axillary clusters opposite the leaves or mostly lower down on the stouter branches. *Peduncles* very short, woody and decurrent; *pedicels* rusty-tomentose, about 2 cm. long with a median, acute, amplexicaul bract. *Sepals* 2 cm. long, thick, spreading, ovate-triangular, obtuse, connate at the thickened base, tomentose on both surfaces except the base inside. *Petals* coriaceous, about 2·3 cm. long, inner smaller, about 1·8 cm. long, claw about 1 cm. long, blade (of outer) boat-shaped, convex outside with a concavity inside, obtuse, both sets rusty-tomentose on both surfaces when dry except the glabrous base inside, blade of inner nearly orbicular. *Stamens* numerous with flat hexagonal or rounded tops forming a close pattern and concealing the anther cells when

viewed from above, 2–2·5 mm. long, filament about ¼ length of stamen. *Young ovaries* numerous, about 5 mm. long, oblong, sericeous, stigma rather compressed due to crowding, pileate and lamellate, the top flat or convex and narrowed. *Carpels* globose or slightly pear-shaped, sessile, glabrous, surface dull or slightly rough, thick-walled, 3 cm. long and about 2·7 cm. in diam. *Seeds* about 10 in 2 rows, shining.

KEDAH: Koh Mai F.R., *Kiah S.F.N. 35221* (S., K., Kew).

PENANG: Government Hill, *Curtis 1417* (S., C., Kew); *Nauen,* 13th August, 1940 (S.); Western Hill, *Haniff S.F.N. 9127* (S., K., Kew).

PERAK: *Scortechini 2072* (C.); *1698* (Kew); Larut, *King 6710* (C., D.D., E., Kew); *6789* (C., D.D.); Sungei Larut, *Wray 2301* (S., C.); Gopeng, *King 6135* (C., D.D., Kew); Ulu Bubong, *King 10037* (C.) and *10516* (S., C.); Bubu F.R., *Arnot 30666* (K.); Kuala Saiang Reserve, *Arnot 33773* (K.).

TRENGGANU: Bukit Kajang, Kemaman, *Corner, November 1935* (S.).

SELANGOR: Weld Hill, *Ahmad 5132* (K.); *Omar 8539* (S., K., Kew); 19th mile Ulu Gombak, *Strugnell 11235* (S., K.); Ginting Simpah. *Nur S.F.N. 34814* (S., K., Kew); Rantau Panjang, *Symington 14487* and *40650* (K.).

NEGRI SEMBILAN: Sungei Menyala, Port Dickson, *Wyatt-Smith* and *Sow 64489* (K.).

MALACCA: *Maingay 90,* type (C., Kew); Ayer Panas, *Goodenough 1315* (S.); Sungei Udang, *Derry 474* (S., C.); Jus, *Alvins 704* (S.).

DISTRIBUTION: Confined to Malaya.

In Ann. Jard. Bot. Buitenzorg 2 (1881) 5–8 Scheffer in proposing to place Maingay's two species of *Drepananthus* in the genus *Cyathocalyx* made the formal combination for one of them viz. *C. ramuliflorus* but did not mention the other by name. Accordingly I am here obliged to make the formal combination for *C. pruniferus.*

(4) **C. pahangensis** (Hend.) J. Sinclair, **comb. nov.**

Basonym: Drepananthus pahangensis Hend. in Gard. Bull. Str. Settl. 4 (1927) 49–50; Corner, Wayside Trees of Malaya 1 (1940) 133 Text-Fig. 33.

Small tree 3–10 m. high. *Young twigs* rusty-tomentose. *Leaves* membranous, dark green above, paler beneath, elliptic or elliptic-oblong, glabrous above except on the nerves and sunk midrib, sparsely scabrid-pubescent beneath with stellate and simple hairs, apex acute, base rounded and unequal-sided, often sub-cordate, less often narrowed; nerves 12–16 pairs, oblique, curving more than in *C. pruniferus, ramuliflorus* and *Scortechinii,* anastomosing near the margin in clear curves; reticulations prominent on lower surface, parallel to each other and at right angles to the nerves, (scalariform) also others forming an open, loose network between

the parallel components; length 17–29 cm.; breadth 7–12 cm.; petiole 5–7 mm. long, rusty-tomentose. *Peduncles* mostly confined to the tips of the branches, extra-axillary and usually opposite the leaves, 5–6 mm. long, decurrent, bearing 2–4 rusty pedicels about 5 mm. long with an ovate, acute bract near their base. *Sepals* oblong-ovate, somewhat obtuse, free almost to the thickened base. pubescent on both sides except the base inside, 8–9 mm. long. *Petals* creamy yellow, outer oblong, obtuse, pubescent on both surfaces except base inside, 2–3 cm. long, clawed, blade about 1 cm. wide, as broad as claw; inner slightly smaller, pressed over the stamens, the blade only 5 mm. across. *Stamens* as in *C. pruniferus* and *ramuliflorus*. *Ovaries* 15–17, oblong, angled, densely sericeous, 5 mm. long, stigma discoid or compressed owing to crowding, convex, pileate and very lamellate. *Carpels* (probably not quite mature) spherical and slightly oblique, with a few brown hairs round base of persistent style, drying black, 7 mm. in diam.: stalks slender, 4 mm. long. *Seeds* 2–3, pale brown, slightly longer than broad, 7 mm. across.

TRENGGANU: Bukit Kajang, Kemaman, *Corner S.F.N. 30455* (S., Kew) and *30505* (S.).

PAHANG: Baloh Reserve, Kuantan, *Lambak 3141* (S.) type material: also *Yeop 0830* (S., Kew) type material; Pulau Manis F.R., Kuantan, *Mohamud 0824* (S.) type material; Bukit Segu, *Henderson S.F.N. 25079* (S.); Rumpin River, *Fox, 23rd April, 1893* (S.); Bukit Saup. *Ja'amat 16520* (S., K.); Kuala Baloh, *Soh 15082* (S., K.); Kuantan. *Burn-Murdoch*, May 1904 (S.) type material.

JOHORE: Sungei Sedili, *Corner, 7th July, 1940* (S.) also *Ngadiman S.F.N. 36855* (S., K., Kew); 14th and 13¼ mile Mawai-Jemaluang Road, *Corner S.F.N. 29014* (S., K., Kew); and *29432* (S., K., Kew): Sungei Kayu, *Corner S.F.N. 29198* (S., K.); *Kiah S.F.N. 32080* (S., K., Kew); Gunong Panti, *Abdul Kadir 18059* (S.); *Holttum, 11th April, 1925* (S.) type material; Sungei Buloh, Kasap, Mawai-Jemaluang Road, *Corner S.F.N. 29982* (S.).

DISTRIBUTION: Malay Peninsula.

A smaller tree with thinner leaves than *C. ramuliflorus* or *pruniferus*. It resembles *C. pruniferus* most especially in the flowers. the petals of which are of the same shape. The blade of the petals above the claw is broad and not linear or filiform as in *C. Ridleyi*. *ramuliflorus* and *Scortechinii*. The flowers too are fragrant but they are at the tips of the branches and not on the older and thicker parts. The lower surface of the leaves has a harsh and not the silky touch of *C. pruniferus*. Moreover, the fruit is smaller and not sessile.

(5) **C. carinatus** (Ridley) J. Sinclair, **comb. nov.**

Basonym: Drepananthus carinatus Ridley, F.M.P. 1 (1922) 38; Henderson in Gard. Bull. Str. Settl. 4 (1928) 215.

Tree. *Young twigs* rusty-tomentose. *Leaves* sub-coriaceous, broadly oblong to ovate, margin slightly revolute, apex rounded and abruptly acute, base cuneate, sometimes slightly rounded, upper surface glabrous except the nerves and the sunk midrib, lower softly tomentose with stellate and simple hairs; nerves about 13 pairs, prominent beneath, oblique, curving slightly, anastomosing near the margin, reticulations between them at right angles to them, best seen on the lower surface; length 12–16 cm.; breadth 6–7 cm.; petiole 1–2 cm. long, tomentose. *Sepals* broadly orbicular, almost reniform, nearly free to the thickened base, obtuse, pubescent on both surfaces, about 7 mm. long, persistent in fruit. *Petals* 2–3 cm. long and 3 mm. wide, linear, blunt, pubescent, the blade flat, the claw orbicular, 5 mm. long, vaulted over the stamens. *Stamens* numerous, 1–1·5 mm. long, connectives flat-topped or with a small depression on the top in dried material, the outline circular or 5–6 angled. *Ovaries* 3 mm. long, cylindric, sericeous; stigmas disc-shaped, pileate, lamellate, agglutinated. *Carpels* about 5, globular, hairy, 1–2 cm. diam; stalks 3 mm. long. *Seeds* several.

PERAK: Telok Anson, *Calomb 24816* (S., K.).

SELANGOR: Sepang, *Denny, November 1941* (S.); Sungei Buloh, *Symington 49927* (K.); *Abu 2263* (S., Kew) type material; Rantau Panjang Reserve, *Strugnell 12691* and *13969* (S., K.); Klang Water Catchment area, *Burkill S.F.N. 6843* (S., Kew) type material; Bukit Tunggol Forest Reserve, *Kiai 8365* (K.); Sungei Tinggi, *Symington 44042* (K.).

DISTRIBUTION: The variety *deltoideus* Airy-Shaw from Borneo. Kew Bull. (1939) 288.

This species resembles *C. biovulatus* Boerl. (*Xylopia rotundata* Ridley) in its orbicular calyx. The petals of *C. biovulatus* are slightly narrower and acute, not obtuse. Further its leaves are quite different. They are glabrous and much more rounded.

(6) **C. olivaceus** (King) J. Sinclair, **comb. nov.**

Basonym: Xylopia olivacea King, Mat. F.M.P. Vol. 1 No. 4 (1892) 368 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 150 Pl. 196; Ridley, F.M.P. 1 (1922) 94.

Small tree. *Twigs* pubescent at the tips, glabrous lower down, striate, brown. *Leaves* coriaceous, elliptic-oblong or slightly obovate, closely two-ranked, glabrous, dull on both surfaces when dry, the lower paler brown and of parchment-like texture, shortly and abruptly acuminate, base cuneate, the margins slightly revolute, midrib sunk above, raised and slightly verrucose beneath; nerves 6–8 pairs, slightly raised above, bold beneath, curving and interarching 3–4 mm. from margin; reticulations loose and faint above,

not visible below; length 9–21 cm.; breadth 5–8·5 cm.; petiole 8 mm. long, ringed. *Flowers* 1–2, extra-axillary, usually opposite the leaves, arising from a very short decurrent peduncle, 3–4 mm. long. *Pedicels* 1–1·5 cm. long, rusty-puberulous and with an amplexicaul median bract about 2 mm. long. *Sepals* ovate, acute, free caul median bract about 2 mm. long. *Sepals* ovate, acute, free nearly to the thickened base, puberulous on both surfaces, 4–5 mm. long. *Petals* sub-equal, greenish-yellow, minutely tomentose on both surfaces, linear, acute, 3·5–4 cm. long and 3 mm. broad, claw orbicular, concave, closely pressed over the stamens. *Stamens* numerous, 2–3 mm. long with flat-topped or oblique connectives hiding the anther cells; short filament about ¼ length of whole stamen. *Ovaries* 2, oblong, angled, sericeous, 3 mm. long with a pileate disc-shaped or slightly convex stigma. *Ripe carpels* 2, globular with an imperfect lateral ridge, minutely tawny-tomentose, minutely apiculate, 1·4 cm. in diam., nearly sessile; stalks about 1 mm. long. *Seeds* 4–5 in 2 rows, discoid, pale brown, shining, separated by imperfect dissepiments.

PERAK: *Scortechini 469b* (C.); Larut, *King 6653* (C., D.D., Kew); *5463* (C.); *4946* (C., D.D., Kew); *3853* (C., Kew); *2179* (C., E.); *6666* (C., Kew); *2835* (C.); *3382* (C., Kew); Waterfall Hill, *Wray 2054* (S., C.); Briah, Larut, *Wray 4207* (S., C.); Maxwell's Hill, *Wray 2818* (S., C., Kew); *Curtis 1992* (S., C.); Sungkai, Bikum Reserve, *Burn-Murdoch 367* (S., Kew); Taiping Hills, *Ridley 11925* (K.) and *August 1904* (S.).

DISTRIBUTION: Perak. Type material = King, Scortechini and Wray.

This species is best distinguished from the others by the following combination of characters:—the glabrous leaves with widely curving veins, the linear, acute petals and the two tawny, sessile carpels.

(7) **C. ramuliflorus** (Maingay ex Hk. f. et Th.) Scheff. in Ann. Bot. Jard. Buitenzorg 2 (1881) 7.

Basonym: Drepananthus ramuliflorus Maingay ex Hk. f. et Th. Fl. Br. Ind. 1 (1872) 56; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 288 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 49 Pl. 66; Ridley, F.M.P. 1 (1922) 38; Corner, Wayside Trees of Malaya 1 (1940) 133 Text-Fig. 35; Airy-Shaw in Kew Bull. (1939) 288.

Tall monopodial tree, branches spreading or horizontal at the top. *Young twigs* rusty-tomentose. *Leaves* coriaceous, two-ranked, dark green above, paler green beneath, oblong, apex rounded and obtuse or slightly acute, base sub-cordate or unequal-sided, glabrous above except the sunk midrib, tomentose indumentum of stellate and simple rufous hairs (½ mm. long) beneath on the entire surface; nerves about 18 pairs, prominent, straight, oblique,

nearly parallel, interarching close to the thickened revolute margin; reticulations on the lower surface between the main veins parallel to each other, prominent; length 16–33 cm. or more; breadth 8–13 cm.; petiole stout, pubescent, channelled. *Flowers* in dense clusters, extra-axillary on the older branches, the peduncle represented by a decurrent tubercle. *Pedicels* 7 mm. long, rusty-pubescent, with an amplexicaul bract 2 mm. long. *Sepals* about 5 mm. long, ovate, acute, free nearly to the base, rusty-pubescent outside, glabrous inside. *Petals* sub-equal, 1·3–1·5 cm. long with orbicular, vaulted claws and linear, terete, obtuse blades about 2 mm. thick, tomentose except at base inside. *Stamens* 2 mm. long, connectives as in *C. pruniferus*. *Ovaries* 4 mm. long, oblong, sericeous, 5–8; stigmas discoid, pileate and lamellate or rather compressed owing to crowding. *Ripe carpels* ovoid, slightly oblique, sessile, somewhat rusty-pubescent, the hairs rubbing off easily, a very shallow groove sometimes present down the inner, anterior sides, two rows of hairs along each side of the groove, length, about 2 cm.; diam. 1·8 cm. *Seeds* 8–10 in 2 rows. **Fig. 11.**

MALACCA: *Maingay 91* (Kew) type; *Alvins 1215* (S.); Ayer Panas, *Hervey, date 1890* (S.).

SINGAPORE: Jurong, *Corner S.F.N. 26162* (S., K., Kew); Kranji, *Ridley 6176* (S.); Bukit Timah, *Corner 15th November, 1937;* Gardens' Jungle, *Ngadiman S.F.N. 34508* (S., Kew); *Ridley 4454* (Kew).

DISTRIBUTION: Borneo and Sumatra.

The leaves resemble those of *C. pruniferus* but they are much more tomentose beneath with longer hairs and feel harsh when rubbed. Those of *pruniferus* feel like silk when rubbed. The margin is thicker and revolute and the intramarginal curves where the veins join are more prominent than in *pruniferus*. The dimensions of the petals too are quite different.

(8) **C. Scortechinii** (King) J. Sinclair, **comb. nov.**

Basonym: Xylopia Scortechinii King, Mat. F.M.P. Vol. 1 No. 4 (1892) 367 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 149 Pl. 195; Ridley, F.M.P. 1 (1922) 94.

Tree 15–23 m. high. *Young twigs* minutely rusty-tomentose. *Leaves* elliptic-oblong, slightly coriaceous, dark green, glabrous except the sunk midrib above and the raised midrib beneath and occasionally on the veins which may be minutely puberulous with stellate hairs, apex rounded, shortly and bluntly acuminate, base unequal-sided, rounded, rarely acute, margins slightly revolute; nerves 12–15 pairs, very straight and nearly parallel, oblique, prominent on lower surface; reticulations best seen below, parallel

to each other and at right angles to the nerves; length 12·5–23 cm.; breadth 6·5–8 cm.; petiole 1–1·3 cm. long, pubescent. *Peduncles* extra-axillary usually opposite the leaves, 5 mm. long, woody, decurrent, bearing 2–3 flowers on very short 3–5 mm. long pedicels, each flower with an amplexicaul bract at the base of the calyx. *Sepals* 4–5 mm. long, broadly ovate, acute with reflexed tips,

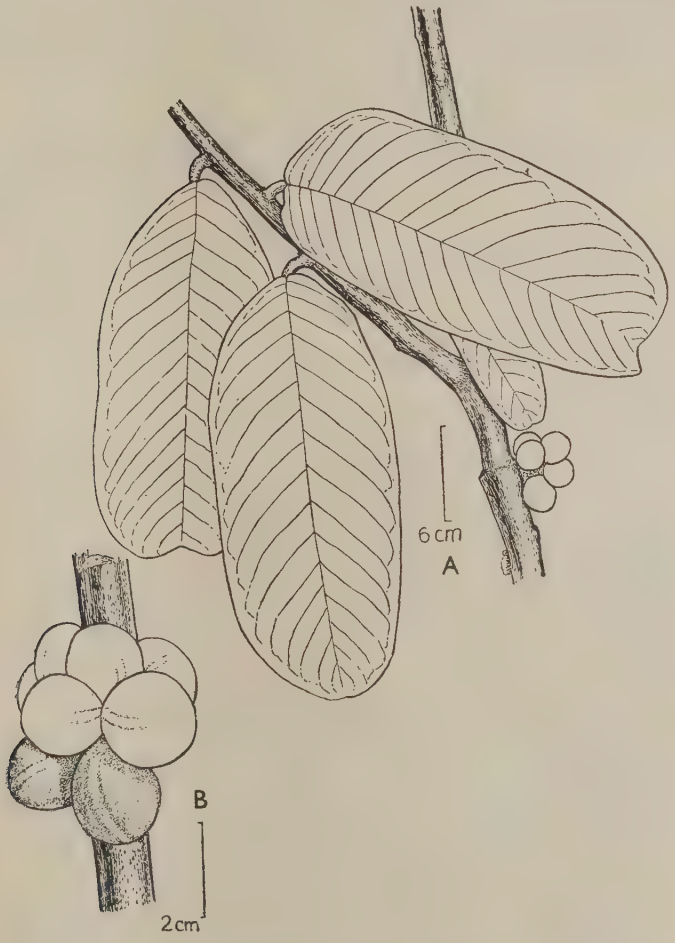


Fig. 11. *Cyathocalyx ramuliflorus* (Maingay ex Hk. f. et Th.) Scheff. A, Fruiting twig. B, Fruits.

nearly free to the thickened base, rusty-tomentose outside, almost glabrous inside. *Petals* greenish-yellow, sub-equal, 3–5 cm. long, linear, obtuse, minutely pubescent except inside on the glabrous claws which are slightly keeled, orbicular and closely vaulted over the sexual organs, the inner three adhering (even when they fall) at the junction of the claw and the blade. *Stamens* 1·5–2 mm. long with oblique connectives; filament about ¼ of the whole stamen. *Ovaries* 3 mm. long, about 12, sericeous, oblong, angled; stigmas oblong and somewhat tongue-shaped, closely agglutinated. *Ripe carpels* ovoid, blunt, glabrescent, 2 cm. long and 1·4 cm. in diam. *Seeds* about 4, discoid, pale brown, shining.

PERAK: Kuala Depang, *King 8241* (S., C., Kew) type material; *Scortechni 1781* (C., Kew) type material; Dengong to Kampar Road, *Haniff S.F.N. 14318* (S., K., Kew); Telok Anson, *Calomb 24813* (S., K., Kew).

PAHANG: Kuala Tahan, *Seimund F.M.S. Museum No. 919* (S.); Mentigi F.R., Cameron Highlands, *Md. Tasi 34115* (K.).

DISTRIBUTION: So far only recorded from the above localities.

This species may be known from the others by the following combination of characters:—the very straight parallel veins, the glabrous or almost glabrous leaves and the linear petals.

11. ARTABOTRYS R. Brown in Bot. Register (1820) T. 423.

Climbers or scandent shrubs. *Midrib* (as in *Cyathocalyx* section *Eucyathocalyx*), raised on upper surface of leaf or flush with it. *Flowers* hermaphrodite, solitary or fascicled, white or yellow, often fragrant. *Peduncles* extra-axillary, opposite the leaves, reflexed, flattened and hooked, bearing the pedicels. *Bracts* small, often caducous. *Sepals* 3, valvate. *Petals* 6 in two series, valvate, the blade flat, oblong, ovate-lanceolate or linear and terete; claws distinct, orbicular often with a projecting rim on the inside where the blade joins it, connivent, closely adpressed over the sexual organs as in *Cyathocalyx,* the inner three petals remaining attached at their bases when they fall. *Stamens* with flat-topped or convex connectives concealing the dorsal anthers. *Torus* flat or concave. *Ovaries* few to many; stigma elongated, rod-like or leaf-like in which case it may be lobed, the lobe often bent, a slight groove running down its adaxial side to base of ovary, sometimes seen as a faint line in the mature fruit. *Seeds* 2, erect, collateral.

TYPE OF GENUS: *A. uncinatus* (Lamk.) Baill. Hist. Pl. 1 (1867) 232; Merr. in Philip. Jour. of Sc. 7 (1912) 234; Fl. Manila (1912) 206; Sp. Blancoanae (1918) 150. *Synonym: A. odoratissimus* R. Br. in Bot. Reg. (1820) T. 423.

DISTRIBUTION: Tropical Africa and Eastern Asia. Over 100 species.

This genus is easily recognized by its hooked, flattened peduncular branches, by which the plant climbs. In *A. speciosus* Kurz the peduncles are not hooked during flowering but during fruiting they become bent. In one species *A. spinosus* Craib from Siam, short spines are present and the leaves are obovate and retuse at the apex. Spines are very unusual in *Annonaceae* and this is the only example of Old World species I can quote. In the New World *Annona spinescens* and *A. punicifolia* have spinescent branches.

KEY

a. *Platypetala*—Petals both sets broad, flat, lanceolate

b. Sepals 1·2 cm. long or more, densely yellow-brown, tomentose with hairs 1–2 mm. long

c. Leaves sub-bullate above when dry, pubescent or tomentose beneath; veins and reticulations bold and prominent beneath; carpels minutely tawny-tomentose (1) **A. Wrayi**

c. Leaves not bullate above, slightly pubescent when young only; veins and reticulations only slightly prominent beneath; carpels glabrous (2) **A. crassifolius**

b. Sepals 4–8 mm. long, glabrous or only slightly pubescent

d. Flowers 3·5 cm. long or over

e. Petals 3·5–4 cm. long; flowering pedicels 7 mm.–1 cm. long. Leaves black when dry (3) **A. oxycarpus**

e. Petals 4·5–5 cm. long; flowering pedicels 1·2–1·8 cm. long. Leaves not black when dry (4) **A. Lowianus**

d. Flowers 2·5 cm. long or less

f. Anther connective acute at top; fruit with several faint ridges, stalked, stalk 1 cm. long (5) **A. pleurocarpus**

f. Anther connective flat-topped, fruit without ridges, sessile (not seen in *Scortechinii*)

g. Leaves elliptic to elliptic-oblong, 9–15 cm. × 5–7 cm.; flowers 1·8–2·5 cm. long (6) **A. venustus**

g. Leaves ovate-lanceolate 7–8 cm. × 2·8–3 cm.; flowers 1·4–1·8 cm. long (7) **A. Scortechinii**

b. Sepals 5–8 mm. long, tomentose or slightly rufous-pilose with hairs less than 1 mm. long

h. Leaves 19–30 cm. × 8–11 cm. Flowers 2 cm. long (8) **A. grandifolius**

h. Leaves 16·5–23 cm. × 6·5–7·5 cm. Flowers 3·5 cm. long (9) **A. oblongus**

a. Angustipetala—Petals narrow, linear or cylindric especially the inner

i. Outer and inner petals with terete blades

j. Leaves strongly ribbed; length 9–23 cm.; ripe carpels 7·5 × 1·5 cm. (10) **A. costatus**

j. Leaves not strongly ribbed; length 5–13 cm.; ripe carpels 1–1·2 × ·7 cm. (11) **A. suaveolens**

i. Outer petals flat, very little diminution in breadth where blade joins claw

k. Fruit with several ridges; outer petals 9 mm.–1 cm. long (12) **A. gracilis**

k. Fruit without ridges; outer 1·3–1·5 cm. long (13) **A. Maingayi**

(1) **A. Wrayi** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 286 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 48 Pl. 64; Ridley, F.M.P. 1 (1922) 40.

Climber. *Young twigs* rusty-tomentose, later glabrous and distinctly striate. *Leaves* coriaceous, oblong-elliptic to elliptic, apex acute or acuminate, base acute or rounded, glabrous above and sub-bullate, pubescent beneath in the Perak specimens, densely rusty-tomentose beneath in those from Johore and Singapore, margins slightly revolute, midrib above flat, not grooved, the 10–12 pairs of opposite or alternate nerves above raised but also set in depressions, below prominent; reticulations scalariform between the nerves, with a second set forming a loose, open network; length 18–28 cm.; breadth 6–12·5 cm.; petiole 5 mm. long, stout, pubescent, grooved on upper surface. *Peduncles* hooked, pubescent; pedicels 1–1·3 cm. long, gradually thickened upwards, rusty-tomentose with an amplexicaul, acute, 7 mm. long, basal bract. *Flowers* 2·5 cm. long. *Sepals* 1·2–1·7 cm. long, rusty-tomentose on both sides except base inside, (hairs 1–2 mm. long), ovate, acute, edges slightly revolute. *Petals* coriaceous, pale yellow, subequal, ovate-oblong, sub-acute, keeled, contracted at the claw, softly adpressed-sericeous except the claws inside which are glabrous and pink. *Stamens* 2–3 mm. long, with flat-topped or oblique

connectives. *Ovaries* numerous 3–4 mm. long, pubescent; style linear or rod-shaped, acute at tip and slightly bent. *Ripe carpels* shortly tawny-tomentose, up to 20, pink-carmine, obovoid, sessile, apex rounded and slightly mucronate; length 3–3·4 cm.; diameter 1·8–2 cm. *Seeds* 2, testa shining.

PERAK: Waterfall, Larut, *Wray 4006* (S.) and *King 3615* (C., Kew) type material; *2663* (S., C.) type material; Relau Tujor, *Wray 2234* (S.) type material.

JOHORE: Sungei Kayu, *Corner S.F.N. 32301* (S., K., Kew).

SINGAPORE: Cluny Road, *Ridley 6051* (S., C.) now extinct; Bukit Mandai, *Ridley 3630* (S., C.); Bukit Timah, *Ngadiman, 3rd March, 1938* (S.).

DISTRIBUTION: As above.

Easily recognized by its large leaves, pubescent or tomentose beneath and the yellow sericeous-tomentose petals. Seems to be near *A. lanuginosus* Boerl. but I have seen no specimens of Boerlage's plant. Also closely allied is Merrill's *A. trichopetalus* from Borneo but its leaves are nearly glabrous beneath except for the midrib and further they are not bullate.

(2) **A. crassifolius** Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 54; Kurz, For. Flora Burma 1 (1877) 30; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 282 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 42 Pl. 51; Ridley, F.M.P. 1 (1922) 40.

Stout climber. *Young branches* very shortly rusty-tomentose, later glabrous and striate. *Leaves* coriaceous, glossy, dark green and glabrous on both surfaces, the midrib on lower surface sometimes sparsely adpressed-pilose, oblong or narrowly oblong, apex acute or shortly acuminate, base acute; midrib and 9–12 pairs of curving, ascending nerves raised on both surfaces, the midrib flat on the upper surface; reticulations forming a loose, open network; length 13–18 cm.; breadth 5–9·5 cm.; petiole stout, 5–6 mm. long, grooved, soon glabrous. *Peduncles* much hooked, bearing several, short, rusty-tomentose pedicels 5–7 mm. long with an amplexicaul bract near base of flower. *Flowers* c. 3·8 cm. long when mature. *Sepals* 8 mm.–1·5 cm. long (average 1·2 cm.) densely yellow-brown or rusty-tomentose with hairs 1–2 mm. long, ovate, lanceolate, acute. *Petals* coriaceous, oblong-lanceolate, densely yellow-tomentose on both surfaces except base inside, subacute 2·5–3 cm. long; the inner slightly shorter when young, equalling the outer when mature, their bases glabrous and rose-pink on both sides. *Stamens* 2·5–3 mm. long with pink filaments 1/3 the length of the entire stamen; connectives round-topped or

convex, projecting beyond the anthers. *Ovaries* numerous, narrowly ovoid, 4–5 mm. long, pubescent; stigma clavate or sub-cylindric, constricted where it joins ovary. *Torus* sub-globose. *Ripe carpels* about 8, sessile, sub-ovoid to ovoid, shortly beaked, glabrous, 2·5–4·3 cm. long, diameter 2–3 cm.; pericarp thick. *Seeds* 2, collateral, oblong, compressed, 2·3 cm. long and 1·3 cm. broad.

PERAK: Taiping, *King 8384* (C., Kew).

TRENGGANU: Kemaman, *Symington 26969* (K.); Ulu Bendong, Kajang, Kemaman, *Corner S.F.N. 30175* (S., Kew).

PAHANG: Kuantan, *Sow 15075* (S., K.); Tasek Bera, *Henderson S.F.N. 24437* (S., Kew).

SELANGOR: Kuala Lumpur, *Curtis 2314* (S., C., D.D.).

MALACCA: *Maingay 32* (C., Kew); Hervey, *date 1891* (S.); Merlimau, *Alvins, 20th April, 1886* (S.); Bukit Tampin, *Goodenough 1867* (S.); *Griffith 426* (Kew) type material.

SINGAPORE: Bukit Timah, *Ridley, 10853* (S., Kew); *Sinclair S.F.N. 38845* (S., E.).

DISTRIBUTION: Burma.

The short pedicels distinguish it from *A. venustus* while the sepals are more tomentose than in *A. grandifolius* or *oblongus*.

(3) **A. oxycarpus** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 283 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 44 Pl. 56; Ridley, F.M.P. 1 (1922) 41.

Climber 20–25 m. long. *Young twigs* very slender, glabrous and finely striate. *Leaves* thinly coriaceous, lanceolate or oblong-lanceolate, caudate-acuminate with acute base, shining, glabrous on both surfaces, black when dry; main nerves 8–9 pairs, curving deeply and rather widely spaced, interarching some distance from the margin, slender but distinct on both surfaces; reticulations forming a loose, open network; length 7–14 cm.; breadth 3–4 cm.; petiole 3–5 mm. long, glabrous. *Peduncles* opposite the leaves, hooked, glabrous, slender. *Pedicels* 7 mm.–1 cm. long, glabrous, thickened upwards as in *A. Lowianus*. *Flowers* 4–4·4 cm. long. *Sepals* coriaceous, ovate, acute, glabrous, 4–5 mm. long. *Petals* pale yellow, adpressed-pubescent, coriaceous, rather erect, 3·5–4 cm. long with flat blade, 1·2 cm. broad; inner slightly smaller. *Stamens* 2 mm. long with rounded connectives. *Torus* with sericeous, erect hairs. *Ripe carpels* numerous, sessile, glabrous, narrowly elliptic, tapering to each end; length 2·5–3 cm.; diameter 1 cm. *Seeds* 2, plano-convex, compressed, 6 mm. long.

PERAK: Larut, *King 5605* (C., Kew) and *5150* (C., D.D., Kew) both type material; Relau Tujor, *Wray 3286* (S., C., Kew) also type material.

DISTRIBUTION: Only known from the above.

A rare species. It bears some resemblance to *A. Lowianus* but in *Lowianus* the petals are longer as are also the sepals and the pedicels. In the herbarium material of *A. oxycarpus* the leaves have dried black but they are brownish in *A. Lowianus*.

(4) **A. Lowianus** Scortechini ex King, Mat. F.M.P. Vol. 1 No. 4 (1892) 283 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 43 Pl. 54; Ridley, F.M.P. 1 (1922) 41.

A stout climber. All parts, except the flowers glabrous; *young branches* slender, dark coloured, closely striate. *Leaves* thinly coriaceous, oblong-lanceolate, shortly caudate-acuminate, the base cuneate; both surfaces shining, minutely reticulate; main nerves 8–10 pairs, spreading, interarching 4 mm. from margin; length 9–15 cm.; breadth 3·3–4·5 cm.; petiole 7 mm. long. *Peduncles* 2–3 flowered, glabrous, hooked; pedicels thickened upwards, 1·2–1·8 cm. long, glabrous. *Sepals* triangular, acute, glabrous, 6–7 mm. long, enlarging a little with the fruit. *Petals* fleshy, adpressed puberulous, elliptic-lanceolate above the concave base, obtuse; the outer three 4·5 cm. long, the inner smaller. *Anthers* with a rounded apical process from the connectives. *Ovaries* many, glabrous; stigma linear, acute. *Carpels* (quite young) sessile, ovoid, apiculate; ripe carpels unknown.

PERAK: *Scortechini 2012* (S., C., Kew) type material.

A rare species about which more information is required. The above description is taken from King and in the absence of sufficient material I can not improve or elaborate on his description.

(5) **A. pleurocarpus** Maingay ex Hk. f. et Th. Fl. Br. Ind. 1 (1872) 54; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 281 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 41 Pl. 49; Ridley, F.M.P. 1 (1922) 39.

Climber. All parts glabrous except the flowers. *Young branches* lenticellate, striate, dark coloured. *Leaves* sub-coriaceous, lanceolate-oblong, caudate-acuminate, the base much narrowed, glabrous; both surfaces shining, and reticulate; main nerves 8–10 pairs, spreading, slender; length 10–16·5 cm.; breadth 4–6·5 cm.; petiole 7 mm. long, thick. *Peduncles* flat, stout, much hooked, bearing several ebracteolate pedicels 1·2 cm. long, densely pubescent (bracts probably fall off soon as in certain other species of *Artabotrys*). *Flowers* about 2.5 cm. long. *Sepals* broadly ovate, obtuse. *Petals* flat, elliptic-oblong, obtuse, pubescent on both surfaces; the outer 2·5 cm. long; the inner smaller. *Anthers* with apiculate connectives (probably only the outer stamens, semi-sterile,

are apiculate). *Ovaries* many, slender with linear stigmas. *Ripe carpels* broadly ovoid, mammillate, obscurely grooved, 2·5 cm. long, narrowed into a stalk 1 cm. long. *Seeds* 2 with hard testa.

KEDAH: Yan, *Ridley, June 1893* (S.) fruiting specimen.
PERAK: *Scortechini 331* and *1632* (C.).
MALACCA: *Maingay 34* (Kew) type.
DISTRIBUTION: As above.

A rare species of which there is only one sheet (fruiting) in the Singapore Herbarium. The above description is taken from King with slight additions. The narrow leaves and the stalked carpels are good diagnostic characters.

(6) **A. venustus** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 281 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 41 Pl. 50; Ridley, F.M.P. 1 (1922) 40. Craib, Fl. Siam. Enum. 1 (1925) 36.

Climber 10–25 m. long. *Young twigs* rather slender, minutely puberulous at first, soon glabrous and striate. *Leaves* coriaceous, elliptic-oblong or broadly elliptic, abruptly and shortly acuminate, base rounded or slightly acute, glabrous, upper surface shining, lower yellowish-brown when dry; main nerves 7–10 pairs, thin but raised on both surfaces, curving, ascending and interarching 3–5 mm. from margin; reticulations open and loose; length 9–15 cm.; breadth 5–7 cm.; petiole 5 mm.–1 cm. long, glabrous. *Peduncle* hooked, rather slender, slightly puberulous bearing several slender, glabrescent pedicels 1–2·5 cm. long with a minute caducous bract at base. *Flowers* green to pale yellow, 1·8–2·5 cm. long. *Sepals* coriaceous, puberulous outside, glabrous inside, triangular, acute, free nearly to base, often reflexed, 4–5 mm. long. *Petals* coriaceous, minutely tomentose, oblong-lanceolate, acute, about 7 mm. broad, inner narrower. *Stamens* 1·5–2 mm. long with flat-topped, orbicular connectives. *Ovaries* about 10, oblong, glabrous; stigma elongated, tongue-like. *Ripe carpels* about 6, sessile, narrowly ovoid, apiculate, sessile, at first puberulous, later glabrous, 4 cm. long, diameter 2 cm. *Seeds* 2, oblong, plano-convex, smooth, about 2·5 cm. long and 1·3 cm. broad.

PERAK: Larut, *King 6499* (S., C., Kew); *6968* (C., Kew); *3725* (S., C., Kew); Gopeng, Kinta, *King 4392* (C., Kew) King's four numbers type material; Ulu Tupai, *Wray 2693* (S., C.); Tea Gardens, *Curtis 1993* (S., C.); Taiping Hill, *Haniff S.F.N. 13202* (S.); Maxwell's Hill, *Burkill and Haniff S.F.N. 12958* (S., K.).

PAHANG: No. 4 Camp, Cameron Highlands, *Henderson F.M.S. Museums Herbarium 11671* (S.); Fraser Hill, Pahang-Selangor border, *Nur S.F.N. 11316* (S.).

NEGRI SEMBILAN: Bukit Sutu, *Alvins 2085* (S.).

MALACCA?: *Cantley 193* (S.).

JOHORE: Sungei Kayu Ara, Mawai-Jemaluang Road, *Corner, 24th June, 1935* (S.); Sungei Endau, *Holttum S.F.N. 24938* (S., C.).

DISTRIBUTION: Siam.

Very similar and difficult to distinguish from *A. crassifolius* when in leaf only. *Crassifolius* usually has leaves longer in proportion to their breadth with acute bases. The bases of *A. venustus* can be acute or rounded. I should hesitate to name sterile material of these two species. In flower there is no difficulty; the much shorter, thicker pedicels and the longer, densely tomentose sepals and petals will at once distinguish *A. crassifolius* from *venustus*. The slender, longer pedicel of *A. venustus* alone is a very good character.

(7) **A. Scortechinii** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 281 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 40 Pl. 48; Craib, Fl. Siam. Enum. 1 (1925) 34; Ridley, F.M.P. 1 (1922) 39.

A climber; all parts except the flower and possibly the fruit, glabrous; young branches slender, dark coloured. *Leaves* thinly coriaceous, ovate-lanceolate, shortly acuminate, the base cuneate; upper surface shining; the lower dull when young, very minutely scaly, afterwards glabrous; main nerves 9–11 pairs, spreading, interarching 2 mm. from edge, slender but rather prominent beneath; length of blade 7–8 cm.; breadth 2·8–3 cm.; petiole 3–4 mm. long. *Peduncle* rather slender, 3–4 flowered; pedicels 1·7 cm. long, thickened upwards, puberulous, with a small ovate bracteole at the very base. *Flowers* 1·4–1·8 cm. long. *Sepals* very coriaceous, triangular, acuminate; the apices slightly reflexed, conjoined at the base only, rugulose and adpressed-pubescent externally, 5 mm. long. *Petals* coriaceous, broadly-lanceolate, acuminate, tomentose on both surfaces; the inner three smaller than the outer three. *Anthers* with broad connectives. *Torus* rather flat, sericeous. *Ovaries* glabrous. *Fruit* unknown.

KEDAH: Langkawi, *Curtis 2644* not seen by me.

PERAK: *Scortechinii 488* (S., C.) type.

DISTRIBUTION: Not recorded elsewhere.

See note under *A. Maingayi*.

(8) **Artabotrys grandifolius** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 280 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 39 Pl. 46; Ridley, F.M.P. 1 (1922) 39.

Climber 20–25 m. long. *Young branches* pale, glabrous, with well-marked striations. *Leaves* coriaceous, glossy green above,

duller beneath, elliptic-oblong, glabrous on both sides, apex broad, obtuse or abruptly sub-acute, base cuneate; midrib on upper side raised or flush with surface, broad at base, 10–13 pairs of alternate or opposite nerves also raised on upper surface, fine, more prominent beneath, reddish in dried material, curving and interarching 5–6 mm. from margin; reticulations prominent on both surfaces, forming a loose, open network; length 18–30 cm.; breadth 8–11 cm.; petiole 5 mm. long, stout. *Peduncles* stout, hooked, with 2–3 main branches bearing a number of rusty-tomentose pedicels about 2 cm. long with a minute, ovate-lanceolate, caducous, basal bract. *Sepals* 5 mm. long, ovate, acute, rusty-tomentose. *Petals* cream to pale green, coriaceous, densely and minutely rusty-tomentose when dry except the concave bases inside; the outer broadly elliptic, sub-acute, 1·8–2 cm. long and 7 mm.–1 cm. broad; the inner slightly shorter with incurved apices, the blade 4–5 mm. broad. *Stamens* numerous, 2 mm. long, filament short, connective hiding anther cells. *Young ovaries* 3 mm. long, glabrous; style linear. *Ripe carpels* numerous, glabrous, elliptic-obovoid, apex mammillate, base narrowed gradually into a pseudo-stalk, pericarp hard; length 3·7 cm.; diam. 2·5 cm. *Seeds* 2, large, placed side by side (i.e. representing 2 rows), testa shining.

KEDAH: Koh Mai F.R., *Kiah S.F.N. 35146* (S.).

PERAK: Gopeng, *King 4477* (S., C., Kew) type material; *King 4577* (C.); *Scortechini 1608* (S., C.) type material; Larut, *King 7222* (S., C., E.); Kuala Depang, probably *Ridley, September* 189? (S.); Gunong Keledang, *Ridley, date 1898* (S.).

PAHANG: Tembeling, *Henderson S.F.N. 21811;* 4 miles South of Kuala Lipis, *Burkill* and *Haniff S.F.N. 17175* (S., K., Kew).

DISTRIBUTION: Confined to the Malay Peninsula.

(9) **A. oblongus** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 282 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 42 Pl. 52; Ridley, F.M.P. 1 (1922) 41.

A climber 15–23 m. long, ultimately all parts, except the inflorescence, glabrous; young branches slender, rufous-pubescent; the bark dark coloured when very young, afterwards rather pale, striate. *Leaves* when adult coriaceous, oblong, shortly acuminate, the base acute; both surfaces glabrous, the upper shining, the lower dull, sparsely pubescent along the midrib when young; main nerves 10–12 pairs, inconspicuous on the upper, slightly prominent on the lower surface, spreading, forming two or three series of arches within the margin; length 16·5–23 cm.; breadth 6·5–7·5 cm.; petiole 1 cm. long. *Peduncles* stout, pubescent when young,

bearing 3–4 pedicels. *Flowers* 3·5 cm. long; pedicels about 2·5 cm. long, pubescent, slightly thickened upwards. *Sepals* coriaceous, triangular, acute, concave, spreading, rufous-pilose on both surfaces, slightly conjoined at the base, 6–7 mm. long. *Petals* coriaceous; the portion above the saccate base lanceolate, sub-acute, strigosely tomentose on both surfaces; the claw partly glabrous and partly covered with minute white hairs. *Anthers* compressed, with oblong, obliquely truncate, flattened heads. *Ovaries* few, oblong, glabrous; the stigmas broad, oblique. *Fruit* unknown.

PERAK: Larut, *King 6524* (C., Kew) type.

The above description is taken from King. The sepals of this and *A. grandifolius* are about the same length, tomentose or rufous-pilose (hairs less than 1 mm. long) but never densely so as in *A. Wrayi* or *crassifolius*.

(10) **A. costatus** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 286 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 47 Pl. 63; Ridley in Sarawak Mus. Journ. 1/3 (1913) 78 et F.M.P. 1 (1922) 43.

Climber 5–25 m. long. *Young branches* minutely dark brown-pubescent, later glabrous, dark and striate. *Leaves* thinly coriaceous, medium green, elliptic-oblong, rather constant in breadth from the acute base to the shortly acuminate apex, glabrous, the midrib beneath at base occasionally puberulous; midrib rather broad at base, flush with upper surface or slightly raised; nerves 12–15 pairs, alternate or opposite, slender but distinct, raised on both surfaces, ascending and interarching in two series of curves, (1) a bold one 5 mm. from margin (2) a faint one 2 mm. from margin; reticulations prominent, one series at right angles to the nerves and between them, the second a loose, open network; size variable, small and large leaves present on the same twig; length 9–23 cm.; breadth 4–8·5 cm.; petiole 5 mm. long. *Peduncles* small, the hook dark brown, puberulous and much branched, the branches bearing two rows of minute bracts 1 mm. long. *Pedicels* slender, 1–1·5 cm. long, arising from these bracts. *Flowers* similar to those of *A. suaveolens*, about 1 cm. long. *Sepals* 3 mm. long, ovate, acute, spreading, free except at very base, slightly pubescent. *Petals* creamy-white, tomentose, 1 cm. long, blade 7 mm. long, terete, claw 2–3 mm. long, inner a little smaller, tomentose except the claws inside. *Stamens* numerous, 1 mm. long or less with a flat-topped connective. *Ovaries* 2–5, usually 3, sessile, glabrous, 1 mm. long, globular to ellipsoid. *Torus* pubescent. *Carpels*

2–5, sessile, blunt at each end, glabrous (unripe 2·5 cm. long and 7 mm. in diam·). *Seeds* 2, elliptic.

PERAK: Gopeng, Kinta, *King 4291* (S., C., Kew) and Ulu Bubong, *10184* (C., Kew) both type material.

NEGRI SEMBILAN: Bukit Tampin. Quoted by Ridley in his Flora but no specimen in Herb. Singapore.

SINGAPORE: Mandai, *Ridley 10921* (S., Kew).

DISTRIBUTION: Sarawak, Borneo.

A very distinct species. The flowers are very similar to those of *A. suaveolens* having the blade of the petals terete. The leaves however are usually quite large, the midrib and nerves being conspicuous. Not likely to be confused with any other species. There are no recent collections from Singapore and this species should be looked for again in the Mandai forest.

(11) **A. suaveolens** (Bl.) Bl. Fl. Jav. Anon. (1830) 62 T. 30, and 31D; Hk. f. et Th. Fl. Ind. 1 (1855) 129 et in Fl. Br. Ind. 1 (1872) 55; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 285 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 46 Pl. 61; Boerl. in Icon. Bog. 1 (1899) 120; Ridley, F.M.P. 1 (1922) 42; Craib, Fl. Siam. Enum. 1 (1925) 35.

Basonym: Unona suaveolens Bl. Bijdr. (1825) 17.

Climber. *Young branches* glabrous or slightly pubescent, finely striate and dark coloured. *Leaves* thinly coriaceous, oblong-lanceolate, shape rather variable, both surfaces shining, the upper usually retaining some of the green colour when dry, the apex acute or shortly acuminate, base acute; main nerves 6–8 pairs, much curved and sometimes nearly horizontal, anastomosing in two series (1) with each other about 1 cm. from margin and (2) with the reticulations 2–3 mm. from the margin; reticulations forming a very loose network, visible on both surfaces; length 5–13 cm.; breadth 2·3–5 cm.; petiole, grooved, 5 mm. long. *Peduncles* slender, hooked, much branched, pubescent or glabrous, bearing numerous slender, sparsely adpressed-pubescent pedicels 8 mm.–1 cm. long with a minute, ovate bract at base. *Flowers* about 1 cm. long, creamy-white, fragrant. *Sepals* broadly ovate, acute, joined at the base, sparsely adpressed-pubescent outside, glabrous inside, 2–3 mm. long. *Petals* 7 mm.–1 cm. long, minutely tomentose, the claws glabrous inside, orbicular, 3–4 mm. broad, the limbs narrow, terete, 1–2 mm. thick with an obtuse, slightly incurved apex, those of the outer petals joining the claw dorsally, a short distance from its margin so as to leave a slight ridge. *Stamens* 1 mm. long, rather broad, scarcely any filament, the connectives

flat-topped. *Torus* pubescent. *Ovaries* about 7, ovoid, 2 mm. long, glabrous, grooved down the inner side; style linear, bent at the rather flattened, two-lobed, leaf-like stigma. *Ripe carpels* few, ellipsoid, obtuse, glabrous, 1–1·2 cm. long and 7 mm. in diam. *Seeds* 2. **Figs. 12** and **13.**

Fig. 12. *Artabotrys suaveolens* (Bl.) Bl.

A, Flowering twig. B, Flower. C, Flower with petals detached. D, Inner petals. E, Stamen, front view. F, Stamen, side view. G, Stamen, back view. H, Gynoecium.

The commonest species of *Artabotrys*. There are numerous gatherings from all the states of Malaya except Perlis, Kelantan and Trengganu. It doubtless occurs there also.

DISTRIBUTION: Burma, Assam, Siam, Malay Islands and the Philippines.

There is a similarity to *A. corniculatus* (Blanco) Merr. *Syn. A. Rolfei* Vidal from the Philippines but in that species the sepals are 5 mm. long and more acute, the pedicels shorter and stouter and the petals have a filiform limb 2 cm. or more long.

A. suaveolens when young has very narrow lanceolate, acuminate leaves 1·2–2 cm. broad. Probably some of the other species have similar leaves in their juvenile stages.

(12) **A. gracilis** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 284 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 46 Pl. 60; Ridley in Sarawak Mus. Journ. 1/3 (1913) 77 et F.M.P. 1 (1922) 42.

Climber 20–25 m. long. *Young branches* dark coloured, glabrous, finely striate. *Leaves* slightly coriaceous, very similar to those

Fig. 13. *Artabotrys suaveolens* (Bl.) Bl.
A, Flowering and fruiting twig. B, Flower. C, Fruit.

of *A. suaveolens* and hardly distinguishable, from them, ovate-lanceolate, less variable in shape, often slightly more acuminate; main nerves 8–10 pairs instead of 6–8; length of blade 6–10 cm.; breadth 3–4 cm.; petiole 5–7 mm. long with the leaf blade slightly decurrent on it. *Peduncles* slender, hooked, glabrous, bearing several, slender, glabrous pedicels 1–1·5 cm. long with a minute, obtuse, basal bract. *Flowers* yellow, about 1 cm. long. *Sepals* coriaceous, broadly ovate, acute, glabrous or nearly so with rough surface, 2–3 mm. long. *Petals* fleshy, minutely tomentose, obtuse, 9 mm.–1 cm. long, the inner slightly smaller; the outer with flat blade, the inner more or less triquetrous; both sets but especially the outer having no sharp contraction at the union of blade and claw as in *A. suaveolens,* the claw passing into the blade without decrease in breadth. *Stamens* as in *A. suaveolens* but filaments more distinct. *Ovaries* 3–4, oblong, glabrous with a groove down the inner side; stigma expanded into a discoid, lobed structure as in *A. suaveolens* but slightly broader. *Torus* pubescent. *Ripe carpels* 3–4, sessile, ovoid, glabrous with several vertical ridges; length 2 cm.; diam. 7 mm. *Seeds* 2, compressed, shining.

PERAK: Larut, *King Nos. 4987* (S., C., Kew); *3746* (S., C., Kew); *7543* (S., C., Kew) all type material.

DISTRIBUTION: Sarawak, Borneo.

I should not attempt to distinguish sterile material of this from *A. suaveolens.* The blades of the outer petals are flat and not triquetrous as in *A. suaveolens* and further there is no sharp distinction or at least no diminution in breadth where the blade joins the claw. The ridged carpels will also distinguish it from *A. suaveolens.*

(13) **A. Maingayi** Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 55; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 284 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 45 Pl. 58; Ridley, F.M.P. 1 (1922) 42.

Climber 13–25 m. long. *Young branches* slightly pubescent when young, soon glabrous, striate and black. *Leaves* thinly coriaceous, dark green, shining, glabrous, elliptic with cuneate base and shortly caudate apex; main nerves about 9 pairs, rather thin, curving boldly and interarching about 5 mm. from margin; reticulations a loose, open network; length 8–12 cm.; breadth 4·5–6 cm.; petiole 5–7 mm. long. *Peduncles* short or long and slender, glabrous or adpressed-pubescent; pedicels 1–1·2 cm. long, glabrous with a small bract at base. *Flowers* green at first, then creamy-yellow, changing to dark yellow when the petals fall. *Sepals* 4 mm. long, ovate, acute, slightly pubescent and slightly reflexed. *Petals* reddish-purple at base, sub-equal, 1·3–1·5 cm. long, minutely

pubescent, outer linear-oblong, flat, 5–6 mm. broad at base, no diminution in breadth where claw joins blade, bluntly acute, the inner narrower and terete above claw; the limb about 2 mm. broad. *Stamens* numerous, 2 mm. long, white with broad, flat-topped, pink connectives. *Ovaries* 6–7, glabrous, 2 mm. long. *Ripe carpels* sessile, elliptic-globose, mammillate, thick-walled, glabrous, 3–4 cm. long and 2–3·5 cm. in diameter. *Seeds* 2, plano-convex. **Fig. 14.**

PERAK: Larut, *King 7733* (C., Kew).

MALACCA: *Maingay 34* (C., Kew) type.

SINGAPORE: Gardens' Jungle, *Ridley, 14th August, 1899* (S.); Mac Ritchie Reservoir, *Sinclair 4876* (S.).

DISTRIBUTION: Confined to the above.

A common species in the MacRitchie Reservoir Jungle, Singapore but very poorly represented in herbaria. King's *A. Scortechinii* which is represented by a single miserable specimen (the petals are not present, only sepals) in the Singapore Herbarium

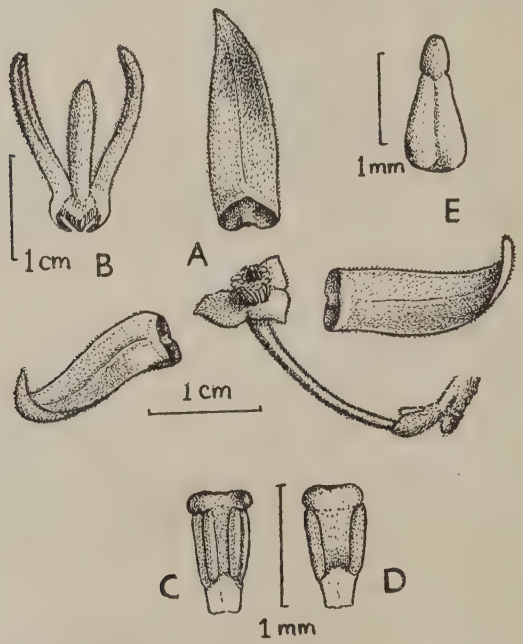


Fig. 14. *Artabotrys Maingayi* Hk. f. et Th.

A, Flower, outer petals and sepals. B, Inner petals. C, Stamen, front view. D, Stamen, back view. E, Gynoecium.

and by similar scanty material collected by Scortechini in the Calcutta and Kew herbaria and of which the fruit is unknown, may be the same as *A. Maingayi*. I am unable to prove this now but this is a problem for future investigation. The description of *A. Scortechinii* given here is taken from King and I am not, for the lack of better material, able to improve on it.

Cultivated Species

Mention must be made here of *A. uncinatus* (Lam.) Merr., *syn.: A. odoratissimus* R. Br., a scandent shrub, native of Ceylon and South India, sometimes cultivated in parks and gardens in Malaya. The leaves are glabrous and narrowly oblong-lanceolate. The peduncles bear 1–2 very fragrant, yellow flowers on pedicels 1·8 cm. long with a caducous bract at the base. The sepals are glabrous and reflexed, about 8 mm. long. The petals are 4–4·5 cm. long, very minutely pubescent, appearing glabrous when fresh, the apices are incurved and the claw projects on the inside where the blade joins it. The elongate, rod-like stigmas are as long as the ovaries and have a faint groove on their anterior surface which is continued down the inner side of the ovary. The ripe carpels hang in dense clusters of about 20 in each, are closely pressed against each other, glabrous, mammillate at the apex and narrowed at the base but sessile.

This species is allied to *A. oxycarpus* and *A. Lowianus* in having large petals and narrow glabrous leaves. From the former it differs in the leaves not turning black on drying and in the carpels not being narrowed at the apex. It is nearer the latter but has slightly smaller petals and reflexed sepals.

12. DESMOS Loureiro Fl. Cochinch. (1790) 352.

Shrubs or scandent shrubs. *Leaves* sometimes glaucous beneath. *Flowers* often fragrant, extra-axillary, opposite the leaves or axillary. *Sepals* 3, valvate. *Petals* valvate in two series or reduced to one series, clawed at the base. *Stamens* numerous, connectives convex, concealing the extrorse anther cells. *Ovaries* numerous; stigma oblong, ovoid or clavate, bent, with a U-shaped opening and a groove continued down the inner adaxial side of ovary. *Torus* small. *Ripe carpels* moniliform with 1–8 segments. *Seeds* 1-seriate, a seed in each segment.

SYNTYPES OF GENUS: *D. chinensis* Lour. and *D. cochinchinensis* Lour. Fl. Cochinch. (1790) 352.

DISTRIBUTION: India, Ceylon, Burma, Siam, Indo-China, Malay Islands and Philippines. Species about 25 or more.

Section Eudesmos Dun. ex DC. Syst. Veg. 1 (1818) 493; Hk. f. et Th. Fl. Ind. 1 (1855) 131 (as a section of Unona.)

Petals 6 in two series, spreading, the apices free. *Inflorescence* extra-axillary or axillary.

Section Dasymaschalon Hk. f. et Th. Fl. Ind. 1 (1855) 134 as a section of *Unona.*

Petals 4–3 or 2. Inner series absent. The edges of the petals cohering, later sometimes free. *Inflorescence* axillary.

Dasymaschalon, first proposed by Hooker f. and Thomson as a section of *Unona* was raised to generic rank by Torre and Harms in 1901. [See Merrill in Philipp. Journ. of Sc. Bot. (1915) 235]. Several authors have followed them. I do not see any advantage gained by keeping *Desmos* and *Dasymaschalon* separate although it is not wrong to do so. Both have moniliform fruits, a character unique in Annonaceae.

Dasymaschalon is considered separate on account of the inner series of petals missing, the outer being 3 or 2 in number and their edges cohering. I do not consider that this reduction counts for very much as I have often found 4 petals in *D. dasymaschalus* as well as 3 showing that the reduction is not absolute. The union of the petals and their modified shape is a direct result of reduction. In those species with 6 petals, there is adequate protection to the sexual organs. The claws of the petals surround them and the limbs are free. But where the petals are reduced to 3 and 2 the petals will have to be modified in size and shape in order to cover the sexual organs and hence we find the margins adhering to give better protection. In *D. longiflorus* the petals separate at the base for some distance upwards when the sexual organs are ripe. Apart from the petals, the stamens, carpels and stigmas in the two sections are very similar and constant.

KEY

a. Section *Eudesmos*—Petals 6 in 2 rows

b. Veins of leaf not very distinct, slender; flowers axillary or opposite the leaves

c. Flowering pedicels 8 mm.–1 cm. long; flowers axillary (1) **D. Dunalii**

c. Flowering pedicels 3–6 cm. long; flowers opposite the leaves (2) **D. Teysmannii**

b. Veins of leaf distinct and prominent; flowers opposite the leaves or extra-axillary

d. Flowering pedicels 10–15 cm. long; petals not narrowed at the base; leaves glabrous, hardly glaucous beneath (3) **D. cochinchinensis**

d. Flowering pedicels 2–4·5 cm. long; petals narrowed at the base

e. Leaves glabrous and glaucous beneath or very slightly adpressed-pubescent (4) **D. chinensis**

e. Leaves hairy and sometimes glaucous beneath (5) **D. dumosus**

a. Section *Dasymaschalon*—Petals 3 or 2

f. Petioles 4–6 mm. long; flowering pedicels 2–10 cm. long; flowers 2–5 cm. broad at middle, 3-flanged (6) **D. dasymaschalus**

f. Petioles 1–1·5 cm. long; flowering pedicels up to 30 cm. long; flowers 5 mm. broad at middle, terete (7) **D. filipes**

(1) **D. Dunalii** (Hk. f. et Th.) Safford in Bull. Torr. Bot. Club 39 (1912) 506; Ridley, F.M.P. 1 (1922) 45.

Basonym: Unona Dunalii Hk. f. et Th. Fl. Ind. 1 (1855) 131 exl. Concan plant et in Fl. Br. Ind. 1 (1872) 58; Wall. Cat. 6425; Miq. Fl. Ind. Bat. 1 pt. 1 (1858) 41; King, Mat. F.M.P. Vol. 1 No. 4. (1892) 292 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 54 Pl. 71.

Climber 20–30 m. long. *Young twigs* slender, glabrous, striate and with numerous pink lenticels. *Leaves* sub-coriaceous, elliptic-oblong to oblong-lanceolate, glabrous or with a few hairs on the lower midrib, slightly glaucous beneath, drying pale brown on the upper surface, apex acute or sub-obtuse, base rounded or slightly acute; main nerves 11–13 pairs, very fine and faint on both surfaces, scarcely distinct from the secondary ones, curving widely and at times nearly horizontal; reticulations fine like the nerves; length 6–13 cm.; breadth 3–5·5 cm.; petiole 5–7 mm. long. *Flowers* fragrant, axillary or terminal, 3–3·5 cm. long, arising singly or in pairs on a short peduncular axis 2–3 mm. long; pedicels 8 mm.–1 cm. long, minutely adpressed-pubescent with a basal bracteole. *Sepals* broadly ovate, acute, puberulous, reflexed 5–7 mm. long. *Petals* greenish-yellow, narrowly oblong-lanceolate, subacute, puberulous to glabrous, 2·5–3·2 cm. long; the inner smaller.

Ripe carpels numerous, glabrous 1·3–3·5 cm. long, 1–5 moniliform segments; stalks 2·5–3 cm. long.

PENANG: Muka Head, *Curtis 727* (S., Kew); *Wall. Cat. 6425 Porter* (C., E., Kew) type material.

PERAK: Trong, *Wray 2759* (S., C.); Larut, *King 4579* (C.); Gopeng, Kinta, *King 4483* (C., D.D., Kew); without loc. *King 10765* (C., Kew).

PAHANG: Beserah F.R., Kuantan, *Soh 15062* (K., Kew).

MALACCA: *Maingay 38* (C., Kew); *Griffith 451* (Kew).

DISTRIBUTION: Chittagong, Borneo.

Distinguished from the other Malayan species except *D. Teysmannii* by its very fine nearly horizontal nerves. It is peculiar in having an axillary as well as a terminal inflorescence. The flowering material in herbaria is very scanty and old and I have not seen fresh material.

(2) **D. Teysmannii** (Boerl.) Merr. in Philippine Journ. Sc. Bot. Vol. 10 (1915) 235.

Basonym: Unona Teysmannii Boerl. in Icon. Bog. 1 (1899) 103.

Climbing shrub. *Young twigs* slender, dark coloured, lenticellate, minutely pubescent, soon glabrous. *Leaves* as in *D. Dunalii* with very fine, faint nerves but membranous, not sub-coriaceous. *Flowers* also somewhat similar to those of *D. Dunalii* but on long, slender, straight pedicels. *Pedicels* opposite the leaves, 3–6 cm. long with a minute 1–2 mm. bract just above the base. *Sepals* 3–4 mm. long, triangular, acute. *Petals* greenish-yellow, puberulous, thin, lanceolate 6–7 cm. long and 1–1·2 cm. broad at the middle, slightly narrowed at the base, apex obtuse. *Ripe carpels* moniliform.

PERAK: Waterloo near the Bungalow, *Curtis 2705* (S.).

DISTRIBUTION: Borneo. Type in Herb. Kew, legit Teysmann. *Teysmann 185, Soengei* Landak.

Not previously recorded for Malaya. Nearest to *D. Dunalii* resembling it in the leaves but differing in the long slender pedicels opposite the leaves. Perhaps best grouped with *chinensis, cochinchinensis* and *dumosus* on account of the position of the flower.

(3) **D. cochinchinensis** Lour. Fl. Coch. 1 (1790) 352; Ridley, F.M.P. 1 (1922) 45; Craib, Fl. Siam. Enum. 1 (1925) 38; Ast, Suppl. Fl. Gén. L' Indo-Chine 1 Fasc. 1 (1938) 66.

Synonyms: Unona cochinchinensis A. DC. Prod. 1 (1824) 91. *U. desmos* Raeusch. Nomencl. ed. 3 (1797) 161; Dunal, Monog. Anon. (1817) 112; Hk. f. et Th. Fl. Ind. 1 (1855) 134 et in Fl.

Br. Ind. 1 (1872) 59; Miq. Fl. Ind. Bat. 1 Pt. 1 (1858) 42; Kurz, For. Fl. Burma 1 (1877) 34; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 293 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 55 Pl. 73. *U. pedunculosa* A. DC. Mém. Anon. (1832) 28. *U. pedunculosa* Wall. Cat. 6240 e.

Climber or scandent shrub. *Young branches* minutely pubescent, soon glabrous, brown with numerous lenticels. *Leaves* sub-coriaceous, medium green above, pale green beneath, oblong to oblong-elliptic, apex acute or slightly obtuse, base rounded, often emarginate, occasionally sub-acute; glabrous, the upper midrib occasionally pubescent; nerves 13–16 pairs, faint above, thin but prominent beneath, oblique, curving slightly; reticulations above forming a fine network; sometimes not visible, scalariform on lower surface, fine and sometimes not visible; length 10–22 cm.; breadth 5–10 cm.; petiole 7 mm. long, glabrous. *Pedicels* extra-axillary, slender 10–16 mm. long, wine-red, glabrous or minutely adpressed-pubescent with a sub-median linear bract about 4 mm. long. *Sepals* 7 mm. long, ovate-lanceolate, acuminate, sparsely adpressed-pubescent outside, glabrous inside. *Petals* coriaceous, first greenish-yellow, then yellow, both sets pink at base inside, about 4 cm. long, broadly ovate at middle, base not abruptly narrowed as in *D. chinensis* and *D. dumosus,* sparsely adpressed-pubescent on both sides. *Stamens* numerous, yellow, 1 mm. long, the connectives convex at top. *Ovaries* 2 mm. long, brownish, hirsute; stigma clavate with U-shaped groove as in *D. chinensis* which runs down adaxial side of ovary. *Ripe carpels* numerous, 2·5–3 cm. long, jointed with 2–5 glabrous segments, the terminal one apiculate; stalks 7 mm.–2 cm. long.

LOWER SIAM: Pungah, *Haniff* and *Nur S.F.N. 3888* (S.); Jalor, L. Siam border, *Gwynne-Vaughan 544* (C., Kew); Bang Son, *Haniff* and *Nur S.F.N. 4244* (S., Kew).

KEDAH: Baling, *Best S.F.N. 21250* (S.).

KELANTAN: Camposa, *Ridley, August 1889* (S.); Kampong Kota, *Gimlette, March 1914* (Kew); Kota Bahru, *Ridley, 14th February, 1917* (Kew).

PENANG: West Hill to Batu Ferengy, *Curtis 1413* (S., C.); Reserve line, B. Ferengy, *Curtis 807* (S., C., Kew); stone quarry, Waterfall, *Haniff S.F.N. 3701* (S.); *Sinclair S.F.N. 39339* (S., Kew).

PERAK: Larut, *King 4182* (S., C., D.D.); *4857* (C., Kew); *482* (Kew); Pulai, *Henderson S.F.N. 23762* (S., K.).

PAHANG: Temerloh, *Hashim C.F. 681* (S., K., Kew); Kuala Semantan, *Ridley 2426* (S., C., Kew).

DISTRIBUTION: Assam, Burma, Siam, Indo-China.

This has thicker leaves than *D. chinensis*. The pedicels are much longer and more slender and the petals of a different shape, broad, not narrowed abruptly at the base. The inner have a knee,

conniving over the sexual organs at first but later spreading. *D. cochinchinensis* is not likely to be confused with the other species. The flower has no scent.

(4) **D. chinensis** Lour. Fl. Cochinch. (1790) 352; Ridley, F.M.P. 1 (1922) 46.

Synonym: Unona discolor Vahl, Symb. Bot. 2 (1791) 63 T. 36; Dunal, Anon. (1817) 111; DC. Prod. 1 (1824) 91; Roxb. Fl. Ind. 2 (1832) 669; Hk. f. et Th. Fl. Ind. 1 (1855) 132 et in Fl. Br. Ind. 1 (1872) 59; Kurz, For. Fl. Burma 1 (1877) 34; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 293 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 56 Pl. 74. *U. Dunalii* Hk. f. et Th. Fl. Ind. (1855) 131 (the Concan plant); Dalz. et Gibs. Fl. of Bombay (1861) 3 non Wall. *U. Amherstiana* A. DC. Mém. Anon. (1832) 28. *U. biglandulosa* Bl. Bijdr. (1825) 16. *U. Lessertiana* Dunal, Anon. (1817) 107 T. 26; DC. Prod. 1 (1824) 90.

Scandent shrub with straggling branches. *Young twigs* slender, striate, dark coloured, the tips slightly pubescent, glabrous lower down. *Leaves* thin, oblong, glabrous, glaucous on lower surface, apex acute or rounded and then abruptly, bluntly acute, base rounded, sometimes emarginate; nerves 8–10 pairs, oblique, rather straight and nearly parallel, faint above, prominent beneath, reticulations very faint or not visible; size variable, 6–13 cm. long and 3–6 cm. broad; petiole 5 mm. long, slender. *Pedicels* extra-axillary, usually opposite the leaves, 3–5 cm. long, slender, glabrous or slightly adpressed-pubescent with a median, acute bract 3 mm.–1 cm. long. *Sepals* ovate-lanceolate, acute, nearly glabrous, 5 mm.–1 cm. long. *Petals* greenish-yellow, narrowly lanceolate, 4–8 cm. long, glabrous or sparsely adpressed-pubescent, 3-5-veined, spreading and curving inwards, canaliculate, concave on the outer surface, convex on the inner surface, abruptly narrowed where blade joins claw, 4–5 mm. broad there, 1–2 cm. broad at the middle of the blade. *Stamens* closely packed, oblong, clumsy, 1 mm. long with flat-topped connectives. *Ovary* oblong, 2 mm. long with hairs 2 mm. long; stigma clavate with a U-shaped groove which is continued down the inner side of the ovary. *Torus* not massive. *Ripe carpels* numerous, 2–6 jointed, 3–4 cm. long, glabrous or minutely pubescent, the terminal joint slightly apiculate; stalks 1–1·4 cm. long. *Testa* medium brown, shining. **Fig. 15.**

DISTRIBUTION: Very wide. Base of Eastern Himalayas right down Malay Peninsula to the Malay Islands, China and the Philippines. There are numerous records from Malaya in herbaria but it has not been collected from the following States: Perlis, Province Wellesley and Johore. There is one record from Singapore without any data or collector's name. It is cultivated in the Botanic Gardens but I have not seen it wild in the island.

With such a wide distribution it is not surprising that this is a variable plant. There are four varieties described in the Fl. Br. Ind. Of these varieties var. *pubescens* has the leaves pubescent beneath. This variety may not be far removed from *D. dumosus* if not a

Fig. 15, *Desmos chinensis* Lour.

A, Flowering twig. B, Flower with petals detached. C and E, Stamen, front view. D, Stamen, back view. F, Gynoecium.

form of it with smaller leaves. Having seen very little of this variety I am not able to decide. The segments of the carpels in *D. dumosus* are larger than those of *D. chinensis*. The leaves of the former are pubescent beneath and the twigs stouter, usually brownish and not black. The fruiting pedicels are shorter and stouter.

(5) **D. dumosus** (Roxb.) Safford in Bull. Torr. Bot. Club 39 (1912) 506; Ridley, F.M.P. 1 (1922) 46; Craib, Fl. Siam. Enum. 1 (1925) 39.

Basonym: Unona dumosa Roxb. Fl. Ind. 2 (1832) 670; Hk. f. et Th. Fl. Ind. 1 (1855) 131 et in Fl. Br. Ind. 1 (1872) 59; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 294 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 57 Pl. 76.

Synonyms: Desmos subbiglandulosus (Miq.) Merr. in Philipp. Journ. of Sc. 10 (1915) 235. *Unona subbiglandulosa* Miq. Ann. Mus. Bot. Lugd.-Bat. 2 (1865) 11. *Oxymitra monilifera* Merr. in Univ. Calif. Publ. Bot. 15 (1929) 73.

Scandent straggling shrub. *Young twigs* tomentose, later glabrous, brown, stout, striate, with numerous lenticels. *Leaves* membranous, medium green, variable in shape, size and pubescence, broadly ovate to oblong-ovate, apex slightly acute or obtuse, base sub-cuneate to rounded and emarginate, sparsely pubescent on the sunk midrib and nerves of the upper surface, rusty-tomentose to pubescent below; nerves 10–12 pairs, rather straight, prominent beneath; reticulations between them faint above but prominent on the lower surface, scalariform; length 6–17 cm.; breadth 4–7 cm.; petiole 7 mm.–2 cm. long, rufous-tomentose, *Flowering pedicels* about 2 cm. long, tomentose with a minute, sub-median bract, shorter and stouter than in *D. chinensis*. *Flowers* similar to those of *D. chinensis* but the petals densely pubescent at first, less so when old, not sericeous, the inner row smaller than the outer, the base above claw much narrowed. *Ripe carpels* 2–3 cm. long, numerous, glabrous, joints 2–4; stalks 1–1·5 cm. long, pubescent. *Seeds* shining with medium brown testa.

KELANTAN: Chaning Woods, *Ridley, February 1917* (Kew).

PERAK: Larut, *King 5520* (S., C.); *5461* near Ulu Kerling (C., D.D., E., Kew); Gopeng, Kinta, *King 4592* (C., D.D., E., Kew); Taiping, *King 8381* (C.); Perak, *King 7772; 10028* (C., Kew); *8617* (C.); Relau Tujor, *Wray 2619* (S., C., Kew).

PAHANG: 8 miles south of Kuala Lipis, *Burkill* and *Haniff S.F.N. 17061* (S., Kew); Lumut, Dindings, *Ridley 10315* (S., Kew).

SELANGOR: Ginting Simpah, *Ridley, Robinson* and *Kloss, March 1917* (Kew).

MALACCA: *Maingay 42 and 43* (C., Kew); *Cantley 356* (S.) Merlimau, *Ridley 1586* (S.); Ayer Panas, *Goodenough 1313* (S., C.) and Sungei? ..... *1632* (C.).

JOHORE: Sungei Kayu, *Kiah S.F.N. 32145* (S., K., Kew).

SINGAPORE: Jurong, 15th mile, *Corner, 19th October, 1932* (S.); Cluny Road, *Ridley 6305* (S., C.); MacRitchie Reservoir, *Sinclair* (seen).

DISTRIBUTION: Assam, Siam, Borneo.

A somewhat variable species. Craib describes a variety *glabrior* from Siam with leaves less pubescent than the typical form. The Assam plant has more oblong leaves than the Malayan. There are forms from Assam that look intermediate between *D. dumosus* and *D. chinensis*. Type in Herb. Kew is Wall. Cat. 6429 from Assam.

(6) **D. dasymaschalus** (Bl.) Safford in Bull. Torr. Bot. Club 39 (1912) 507; Ridley, F.M.P. 1 (1922) 46.

Basonym: Unona dasymaschala Bl. Fl. Jav. Anon. (1828) 55 T. 27; Hk. f. et Th. Fl. Ind. 1 (1855) 135 et in Fl. Br. Ind. 1 (1872) 61; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 296 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 59 Pl. 81.

Synonyms: Unona coelophloea Scheff. in Flora 52 (1869) 300. *U. cleistogama* Burck ex Boerl. in Icon. Bogor. 1 (1899) 127, 201 T. 72. *Dasymaschalon Blumei* Finet et Gagnep. in Bull. Soc. Bot. Fr. Mém. 4 (1906) 143; Merr. in Philip. Journ. Sc. 10 (1915) 237; Craib, Fl. Siam. Enum. 1 (1925) 40. *D. coelophloeum* (Scheff.) Merr. in Philip. Journ. Sc. 10 (1915) 237. *D. cleistogamum* (Burck) Merr. in Philip. Journ. Sc. 10 (1915) 237.

A bushy shrub up to 8 m. high or developing scandent branches if in dense shade. *Young branches* softly rusty-pubescent, later glabrous except in the variety. *Leaves* rather variable, thinly coriaceous, medium green, dull above, slightly glaucous beneath, elliptic-oblong or oblong-lanceolate, apex acute or shortly acuminate, base narrowed, rounded and emarginate, glabrous or sometimes pubescent on the upper and lower midrib and on the nerves beneath; nerves 12–16 pairs, oblique, straight or curving, brownish when dry; reticulations only visible beneath, very faint, scalariform; length 8–22 cm.; breadth 4–8·5 cm.; petiole 4–6 mm. long, part of it concealed by the emarginate leaf base. *Pedicels* axillary or terminal, varying a great deal in length (2–10 cm.) pendulous, seated on a small peduncular protuberance 2 mm. long with a minute bract and a minute bud. *Sepals* 3–5 mm. long, fleshy, triangular, minutely and sparsely pubescent. *Petals* 3–4 (inner row absent) cream coloured, fleshy, ovate, acute to lanceolate-acuminate, 4–13 cm. long, 3-flanged due to the united edges, minutely

adpressed-pubescent outside, later glabrous, glabrous inside, the blade broad where it joins the claw, the claw with a concavity inside. *Stamens* numerous, 2·5–3 mm. long with convex, pink connectives. *Ovaries* densely villous, 4 mm. long; stigma clavate with a U-shaped groove on the inner side. *Ripe carpels* moniliform, bright red with waxy bloom, fleshy pericarp, joints 2–6, the terminal apiculate; stalks 4–5 mm. long. *Seeds* smooth. **Fig. 16.**

DISTRIBUTION: Numerous records, collected from all the states in Malaya. Burma, Siam, Java, Sumatra, Sarawak.

var. **Wallichii** (Hk. f. et Th.) Ridley F.M.P. 1 (1922) 47.

Unona dasymaschala Bl. var. *Wallichii* Hk. f. et Th. Fl. Ind. 1 (1855) 135 et in Fl. Br. Ind. 1 (1872) 62; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 296 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 60.

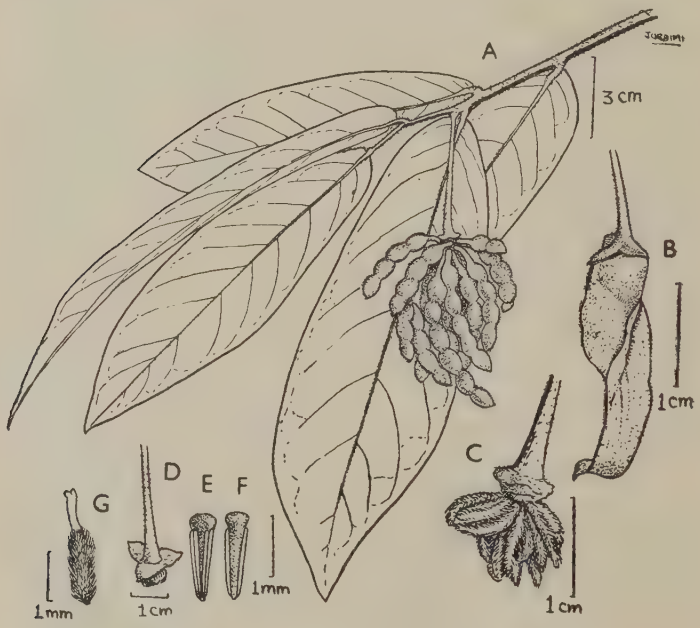


Fig. 16. *Desmos dasymaschalus* (Bl.) Safford.

A, Fruiting twig. B, Flower. C, Young carpels. D, Calyx, back view. E, Stamen, front view. F, Stamen back view. G, Gynoecium.

Branches brown-tomentose. *Leaves* densely pubescent, glaucous-purple beneath.

PERLIS: Bukit Ketri, *Henderson S.F.N. 23120* (S.).

KELANTAN: Sungei Keteh, *Henderson S.F.N. 19662* (S., K.) identification doubtful.

PROVINCE WELLESLEY: Bukit Juru, *Curtis 2426* (S., Kew).

PERAK: Larut, *Wray 3949* (S., C., Kew); Gopeng, Kinta, *King 4564* (S., C., Kew); *4359* (C., D.D., Kew); Ulu Temango, *Ridley 14594* (S.).

TRENGGANU: 38th mile Trengganu-Besut Road (West), *Sinclair S.F.N. 39962* (S.).

PAHANG: Kuantan, *Sow 15083* (S., K.) identification doubtful; Raub, *Strugnell 22258* (S., K.).

JOHORE: 12½ mile Mawai-Jemaluang Road, *Corner S.F.N. 28682* (S., Kew); Tanjong Bunga, *Ridley 6347* (S., C., Kew); Tebrau, *Ridley 13514* (S.).

SINGAPORE: *Wall. Cat. 6421a* type material (Herb. Kew) quoted as *6241* in Fl. Br. Ind.

DISTRIBUTION: Siam.

The northern material of this variety is not quite the same as the southern and may prove to be a distinct species.

(7) **D. filipes** (Ridley) Ridley in Journ. As. Soc. Str. Br. 75 (1917) 6; F.M.P. 1 (1922) 47.

Basonym: Unona filipes Ridley in Journ. Linn. Soc. Bot. 41 (1913) 287.

Shrub 3–6 m. high. *Young branches* glabrous, striate. *Leaves* thinly coriaceous, oblong-lanceolate, glabrous, glaucous, beneath, apex acute, base rounded; nerves 14–18 pairs, curving and ascending, prominent; reticulations forming a loose network, visible on both surfaces; length 16–28 cm.; breadth 6–9·5 cm.; petiole 1–1·5 cm. long, ringed. *Pedicels* axillary, slender, filiform, 25–30 cm. long with a minute bract at base. *Sepals* ovate, acute, glabrous, 2 mm. long. *Petals* 2, red, glabrous, linear, acuminate, coriaceous, adhering by their edges, gaping at base, 2 cm. long. *Stamens* numerous with convex connectives. *Ovaries* villose. *Carpels* 1·5–2·5 cm. long, segments 1–2, mostly 1, ovoid, apiculate, glabrous; stalks about 2 cm. long.

PERAK: Taiping Hill, *Haniff* and *Nur S.F.N. 2500* (S.); Maxwell's Hill, *Wray 609* (S., Kew); Larut, *King 5291* (S., C., D.D., Kew); *2712* (S., C.); *Scortechini 342* (S., C., Kew).

NEGRI SEMBILAN: Bukit Tangga, *Nur S.F.N. 11787* (S.).

SELANGOR: Menuang Gasing, Ulu Langat, *Kloss, February 1912* (Kew) type material.

DISTRIBUTION: Siam.

King confused this species with the Indo-Burmese *D. longiflorus* (Roxb.) Saff. which has similar leaves but shorter pedicels, larger flowers and the segments of the carpels more elongated and not ovoid.

13. MONOCARPIA Miq. in Ann. Mus. Bot. Lugd.-Bat. 2 (1865) 12.

Tall tree. *Hairs* simple, not stellate. *Leaves* with prominent, straight veins which form an intramarginal loop; midrib sunk above. *Flowers* large, extra-axillary. *Sepals* 3, valvate, joined at base. *Petals* 6, valvate, sub-equal, spreading with short claws, not conniving over the sexual organs as in *Cyathocalyx,* nor inner three falling in one piece. *Stamens* as in *Cyathocalyx*. *Ovaries* 1–5, usually 3, adpressed-pubescent; style short, stigma large disc-shaped or pileate, lobed and slightly concave above. *Torus* concave at the insertion of the carpels. *Ripe carpels* sub-globose, sessile, thick-walled. *Seeds* about 10 in 2 rows.

TYPE OF GENUS: *M. euneura* Miq. in Ann. Mus. Bot. Lugd.-Bat. 2 (1865) 12, which is a synonym of *M. marginalis* (Scheff.) J. Sinclair, **comb. nov.**

DISTRIBUTION: Siam, Malay Peninsula, Borneo and Sumatra. Species 1.

Monocarpia is separated from *Cyathocalyx* by the spreading petals not conniving over the sexual organs and the inner three not falling in one piece. The midrib is not flush with the upper surface of the leaf nor raised as in the section *Eucyathocalyx*. The petals resemble those of *Polyalthia* but the stamens and ovaries are those of *Cyathocalyx*. From *Meiogyne* it is separated by its extra-axillary flowers. The petals in *Meiogyne* are also spreading but taper gradually from a broad warted base and are densely tomentose or sericeous-tomentose.

I have compared the Malayan specimens of *Cyathocalyx Maingayi* with *Korthals 916* the type of *Monocarpia euneura* and find them in close agreement. I have therefore made *Cyathocalyx Maingayi* which was doubtfully referred to the genus *Cyathocalyx* by Hooker fil. and Thomson, a synonym of *Monocarpia euneura*. Dr. A. J. Kostermans has informed me that he has compared *Cyathocalyx Maingayi* with the type of *C. marginalis* and finds them similar. I therefore use the older name *marginalis* and make the combination *Monocarpia marginalis* (Scheff.) J. Sinclair.

Craib in Kew Bulletin (1924) 81 has described a second species of *Monocarpia, M. siamensis*. On examination of the type *Kerr 6087,* I find this is not a *Monocarpia* at all and differs in many ways from Miquel's *Monocarpia*. Craib's plant is not a tree

but a climber with stellate hairs on the sepals, petals and young twigs. I have placed it in a new genus *Dasoclema,* the systematic alliance of which is with *Uvaria.* It has flowers opposite the leaves and the pedicels have a minute deciduous bract at the base (there are usually several non-deciduous ones in *Uvaria*). It differs from *Uvaria* in having the inner petals narrower than the outer and in the single ovary with a disc-shaped stigma.

Dasoclema J. Sinclair, **gen. nov.**

Genus novum affine *Uvariae* sed petalis interioribus angustioribus, ovario singulo, stigmate disciformi differt.

Planta lignosa scandes. *Ramuli* foliaque novelli pilis parvis brunneis stellatis parce instructi, mox glabri. *Flores* foliis oppositi. *Pedicelli* 2–3·5 cm. longi, basi bracteam minutam deciduam ferentes. *Sepala* valvata, etiam petala pilis stellatis instructa. *Petala* probabiliter imbricata, interiora exterioribus aequilonga sed angustiora. *Stamina* connectivis truncatis. *Ovarium* unum, plurisulcatum; stigma disciforme, latere adaxiali fissum. *Ovula* circiter 8. *Carpellum* maturum breve-stipitatum.

TYPE OF GENUS: *Dasoclema siamensis* (Craib) J. Sinclair, **comb. nov.** Kerr *6087.* Herb. Kew and Herb. of Agricultural Dept. Bangkok.

BASONYM: *Monocarpia siamensis* Craib in Kew Bull. (1924) 81.

(1) **M. marginalis** (Scheff.) J. Sinclair, **comb. nov.**

Basonym: Cyathocalyx marginalis Scheff. in Ann. Jard. Bot. Buitenz. 2 (1855) 6.

Synonyms: Monocarpia euneura Miq. in Ann. Mus. Bot. Lugd.-Bat. 2 (1865) 12; Ridley in Sarawak Mus. Journ. 1/3 (1913) 76. *Cyathocalyx Maingayi* Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 53; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 278 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 38 Pl. 45; Ridley, F.M.P. 1 (1922) 37; Craib, Fl. Siam. Enum. 1 (1925) 33.

Tree 15–20 m. high. *Young branches* yellowish-brown-pubescent, later glabrous, dark coloured and striate. *Leaves* thinly coriaceous, dark glossy green above, slightly pale beneath, turning black or dark brown when dry, elliptic to oblong, slightly obovate, shortly caudate-acuminate, base rounded or slightly cuneate, upper surface glabrous, the sunk midrib occasionally puberulous, lower surface at first puberulous, later glabrous; nerves 13–15 pairs, oblique, straight, bold on both surfaces, slightly depressed above, interarching near edge, the line of interarching often continuous right round margin, reticulations fine, the main ones scalariform, the others forming a very close network between the main ones;

length 18–25 cm.; breadth 5–8 cm.; petiole 5–7 mm. long, puberulous. *Flowers* 5–7 cm. in diam., solitary or 2–3 together on older twigs, extra-axillary, odourless. *Peduncles* woody, 5 mm.–1 cm. long, bearing 1–3 pedicels, about 1·5 cm. long. *Bracts* two, one at base of pedicel linear, acute, about 3 mm. long, the other below base of calyx or sub-median, rotund to oblong, amplexicaul, 4–8 mm. long. *Sepals* spreading or sub-reflexed, ovate, obtuse or sub-acute, united at middle or at base, puberulous on both surfaces, about 1 cm. long. *Petals* 3–4 cm. long and about 2 cm. wide at middle, greenish-yellow with a reddish-yellow spot near base inside, thin, sub-equal, obovate or broadly obovate-lanceolate, obtuse, the base narrowed into a short canaliculate glabrous claw, thinly pubescent on both surfaces except the base which is densely pubescent outside and nearly glabrous inside. *Stamens* numerous, cuneate, 1·5 mm. long, connectives flat-topped and slightly oblique. *Ovaries* 3–5, oblong-ellipsoid, adpressed-pubescent, 2·5–3 mm. long; style short, stigma disc-shaped or pileate and slightly depressed in the centre, pubescent, the edges slightly lobed. *Ripe carpels* 1–3, sub-globose, 4–6·5 cm. in diameter, minutely pubescent, rough on the outside, sessile, the walls hard, stony, about 5 mm. thick. *Seeds* about 10 in 2 rows, elongated, compressed.

TYPE MATERIAL: Malacca, *Maingay 94* (Kew) is type of *Cyathocalyx Maingayi*. *Korthals 9164* (Kew and Bogor) is type of *Monocarpia euneura*. *Teysmann*, Bangka (Bogor) is type of *C. marginalis*.

DISTRIBUTION: Records from all the Malayan states except Perlis, Province Wellesley and Singapore. Numerous localities in Kedah, Perak, Pahang, Negri Sembilan and Selangor. Outside Malaya it is found in Siam, Borneo and Sumatra.

14. ONCODOSTIGMA Diels in Engl. Bot. Jahrb. 49 (1912) 143.

Trees. *Twigs* pale. *Leaves* papery or slightly coriaceous, with slender primary nerves. *Flowers* axillary, sub-sessile or shortly stalked. *Petals* 6, valvate, shortly triangular-lanceolate or ovate, often very thick with flattened edges; inner excavate at base inside, the concave base being warted and glabrous, both sets diverging as in *Meiogyne*. *Stamens* numerous, connectives flat-topped, orbicular. *Carpels* 2–3 (numerous in *O. monosperma*); ovules numerous in 2 rows; stigma sessile, truncate, sub-conical or discoid. *Ripe carpels* very shortly stalked, tomentose or becoming glabrous. *Seeds* 3–5.

TYPE OF GENUS: *O. leptoneura* Diels in Engl. Bot. Jahrb. 49 (1912) 143.

DISTRIBUTION: Malay Peninsula, Borneo, Sumatra and New Guinea. Species 3.

There is a close alliance with *Meiogyne*. The pale twigs, the axillary flowers, the arrangement of the petals diverging from the base, the rugose patch at the base of the inner series, the stamens with discoid connectives, the discoid stigma and the sub-sessile carpels all recall this genus. The leaves however are quite different and do not have the characteristic texture or the straight prominent veins of *Meiogyne*. Further all the known species of *Meiogyne* are very constant in having the same type of leaf and it is on account of the leaf characters that I have not put the Malayan plant formerly doubtfully known as *Cananga monosperma* into *Meiogyne*.

Guamia and *Oncodostigma* both have claims on it. [See Merrill in Philipp. Journ. Sc. 10 C (1915) 243], but I am not sure if and how far these two genera are distinct, not having seen enough material of each. *Cananga monosperma* differs from the two *Oncodostigma* species in having more carpels. In this respect it is similar to *Guamia* but the carpels are sub-sessile and not stalked as in *Guamia*. It may be that these two genera are similar so I put *C. monosperma* into *Oncodostigma* which was created first.

(1) **O. monosperma** (Hk. f. et Th.) J. Sinclair in Sarawak Mus. Journ. Vol. 5 No. 3 (1951) 605.

Basonym: Cananga monosperma Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 57; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 291; Ridley, F.M.P. 1 (1922) 44.

Synonyms: Unona conchyliata Ridley in Kew Bull. (1912) 384. *U. purpurata* Ridley in Sarawak Mus. Journ. 1/3 (1913) 79. *Desmos conchyliata* (Ridley) Merr. in Journ. As. Soc. Str. Br. (1921) 256.

Tree 8–16 m. high. *Young twigs* pale, striate. *Leaves* thinly coriaceous, elliptic-lanceolate to broadly elliptic, varying considerably in breadth, glabrous on both surfaces, shining, light brown when dry, apex shortly and bluntly acuminate, base cuneate, occasionally slightly rounded; primary nerves about 9 pairs, rather fine, the secondary scarcely distinguishable from the primary; reticulations faint but visible; length 9·5–16 cm.; breadth 3·5–7 cm.; petiole stout, glabrous, grooved on upper side, transversely ringed, 0·5–1·5 cm. long. *Flowers* solitary, axillary; pedicels adpressed-brown-pubescent, often decurved, slightly thicker towards the top, about 1 cm. long, bi-bracteate at the base or one bract appearing midway on the pedicel, the bracts obtuse, pubescent, 1–2 mm. long, the upper slightly longer than the lower. *Sepals*

broadly ovate, triangular, obtuse, pubescent outside, glabrous inside, 2–3 mm. long. *Petals* at first greenish-white, later purplish, pubescent on both surfaces, lanceolate, obtuse, veined, sub-equal, varying considerably in size according to the age of the flower, 2–5 cm. long in young flowers, 3·5–4 cm. in mature flowers, 8–9 mm. broad. *Stamens* numerous, 1 mm. long with orbicular connectives. *Ovaries* numerous, cylindric or angled, pubescent; stigma discoid. *Torus* with setose hairs. *Ripe carpels* numerous, oblong or cylindric, minutely and densely tawny-pubescent at first, the pubescence rubbing off easily and finally glabrous, smooth and brown, obtuse or slightly apiculate, 1–4 seeded with slight depressions between the seeds, not constricted as in *Desmos*.

KEDAH: Koh Mai F. Reserve, *Nur S.F.N. 35169* (S.); 48th mile Jeniang Road, *Nur S.F.N. 36155* (S.).

PERAK: Jor, Batang Padang, *Haniff S.F.N. 14243* (S.); Larut, *King 3844* (C.); Bikinu Reserve, *Burn-Murdoch 364* (Kew).

SELANGOR: 18th mile Ginting Simpah, *Strugnell 12136* (S., K., Kew).

MALACCA: *Maingay 100* type (C., Kew); Selandor, *Alvins 396* (S.); Bukit Besar, *no collector's name, December 1898* (S.).

JOHORE: Sungei Kayu, *Kiah S.F.N. 32160* and *32133* (S.).

DISTRIBUTION: Malaya, Borneo and Sumatra.

The epithet *monosperma* is misleading as there are 1–4 seeds in the ripe carpels.

15. MEIOGYNE Miq. in Ann. Mus. Bot. Lugd.-Bat. 2 (1865) 12; Boerl. in Icon. Bogor. 1 (1899) 123 Pl. 41; Merr. in Philip. Journ. of Sc. 10 (1915) 240.

Trees or shrubs with pale straw coloured twigs. *Leaves* membranous with prominent, often steeply ascending veins on lower surface. *Flowers* axillary, medium to large. *Sepals* 3, valvate, connate at the base. *Petals* 6, valvate in two series, tapering gradually from a broad base upward and diverging, densely tomentose or sericeous-tomentose; the inner slightly shorter in length with a warted patch at base inside. *Stamens* numerous with flat-topped, somewhat oblique connectives, concealing the anther cells when viewed from above. *Torus* convex. *Ovaries* 2–5 with several ovules in 2 rows; stigma discoid, sessile. *Carpels* thick-walled, sessile or sub-sessile.

TYPE OF GENUS: *M. virgata* (Bl.) Miq. in Ann. Mus. Bot. Lugd.-Bat. 2 (1865) 12.

DISTRIBUTION: Western India in Concan and Travancore, Siam, Malaya, Java, Sumatra, Borneo, Hainan and the Philippines. Species 7, probably one or two undescribed from Borneo.

I agree with Merrill and Boerlage that this is quite a distinct genus from *Cyathocalyx*. The texture of the leaves is different; the flowers are axillary and not extra-axillary or opposite the leaves. Further the arrangement of the petals diverging from a broad base, not clawed and constricted and the base not closely adpressed over the stamens, are other features of difference. The warted base of the inner petals is unusual. The stamens and stigmas are of the same type as is met with in *Cyathocalyx*. *Meiogyne* recalls *Polyalthia* with its spreading petals, the stamens are similar but the large number of seeds and the sessile, discoid stigma keep it apart. Other species recently transferred by me from *Unona* and *Polyalthia* respectively are *M. pannosa* (Dalz.) Sinclair and *M. eriantha* (Ridley) Sinclair, see Sarawak Mus. Journ. Vol. 5 No. 3 (1951) 604 and from *Fissistigma, M. Maclurei* (Merr.) Sinclair, see Gard. Bull. Singapore 14 (1953) 41.

(1) **M. virgata** (Bl.) Miq. in Ann. Mus. Bot. Lugd.-Bat. 2 (1865) 12; Boerl. in Icon. Bogor. 1 (1899) 123 Pl. 41; Merr. in Philip. Journ. of Sc. 10 (1915) 240.

Basonym: Unona virgata Bl. Bijdr. (1825) 14; Miq. Fl. Ind. Bat. 1 (1858) 42.

Synonyms: Uvaria virgata Bl. Fl. Jav. Anon. (1830) 43 T. 19, 25B. *Cananga virgata* Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 57. *Cyathocalyx virgatus* King, Mat. F.M.P. Vol. 1 No. 4 (1892) 277 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 37 Pl. 44; Ridley, F.M.P. 1 (1922) 36.

Tree 13–20 m. high with smooth, grey bark. *Twigs* glabrous except the youngest, pale straw coloured and closely striate. *Leaves* variable in size, membranous, elliptic-oblong or oblong-lanceolate, shining above, duller and pale beneath, apex shortly and obtusely acuminate, base acute or rounded, glabrous above except the midrib, slightly and thinly pubescent on the midrib and nerves below; nerves 10–12 pairs, visible above, prominent below, curving and ascending steeply; reticulations close, scalariform, visible on both surfaces; length 10–20 cm.; breadth 3·5–7 cm.; petiole 7 mm.–1 cm. long, pubescent. *Flowers* 1–3, scentless, axillary, sub-sessile with 2 or 3 bracts adpressed to base of flower. *Sepals* tomentose outside, slightly hairy inside, broadly ovate, somewhat obtuse, 4–5 mm. long. *Petals* 1·5–2·5 cm. long, tapering, acute, triangular-lanceoleate, varying a good deal in width, inner slightly shorter in length, greenish-yellow or pink, reddish at base, both surfaces densely tomentose, the concave bases of the inner glabrous and

warted. *Stamens* numerous, pink, 1 mm. long with flat-topped, slightly oblique connectives. *Ovaries* 2–4, usually 3, oblong, 2 mm. long, setose-hairy like the torus; stigma discoid, sessile. *Ripe carpels* cylindric or oblong, very shortly dark brown-tomentose, obtuse, sessile, thick-walled, 4–5 cm. long and 2·5–3 cm. in diam. *Seeds* 8–10 in 2 rows. **Fig. 17.**

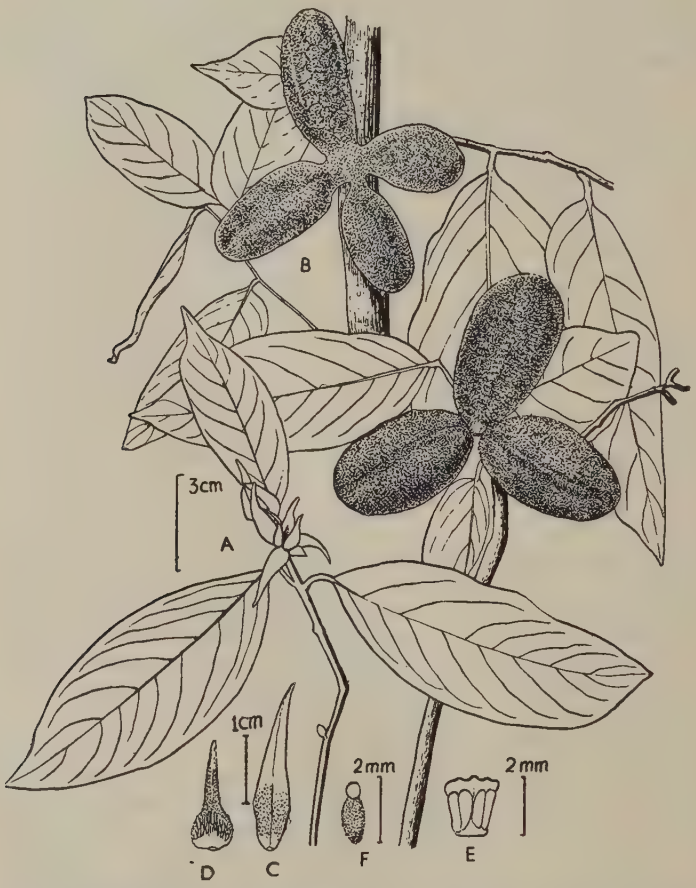


Fig. 17. *Meiogyne virgata* (Bl.) Miq.

A, Flowering twig. B, Fruiting twig. C, Outer petal. D, Inner petal. E, Stamen, front view. F, Gynoecium.

PERAK: Larut, *King 5399* (D.D., C., Kew); *7318* (C., E.); Gopeng, *King 6177* (D.D., C.).

PAHANG: Ayer Besar, Pulau Tioman, *Nur S.F.N. 18865* (S., K.).

MALACCA: *Maingay 92* (C., Kew); *95* (Kew).

JOHORE: Sungei Kayu, *Kiah, 7th October, 1930* (S.); Pulau Aor, *Henderson S.F.N. 18360* (S.).

SINGAPORE: Bukit Timah, *Ridley 4457* (S., C.); *8116* (S., Kew); *Hullett 576* (S.); *Sinclair S.F.N. 39472* (S., Kew, E.); Bukit Panjang, *Ridley, sine num.* (S.); Stagmount, *Ridley, date 1904* also *11254* (S.).

DISTRIBUTION: Malay Peninsula, Borneo, Java and Sumatra.

Rather variable in the size of the leaves and the breadth of the petals.

16. POLYALTHIA Bl. Fl. Jav. Anon. (1830) 68.

Trees or shrubs. *Leaves* glabrous or with simple hairs. *Flowers* hermaphrodite, axillary, extra-axillary, opposite the leaves or below them, on tubercles or woody outgrowths on the older branches or on the trunk or rarely on subterranean, special, woody twigs. *Sepals* 3, valvate. *Petals* 6, valvate in two series, sub-equal, often quite large and showy, coloured, red, orange, yellow, greenish or white, spreading, flat, variously shaped, linear, strap-shaped, lanceolate, ovate, oblong, or obovate, the inner occasionally slightly vaulted, spreading later. *Stamens* usually numerous, cuneate, with flat-topped or slightly convex, orbicular or rhomboid connectives. *Ovaries* numerous or few, oblong, cylindric or angled, with 1 ovule or with 2–5 ovules, basal or superposed; style nearly always absent; stigma rectangular, globose or irregularly shaped with a faint groove on inner side running down the inner, adaxial side of ovary. *Torus* convex. *Ripe carpels* few to many, stalked or sub-sessile. *Seeds* 1–5 with a longitudinal circumferential groove, best seen in the species of section *Monoon*.

Section 1. *Eu-Polyalthia* Bl. *Type of genus: P. sub-cordata* (Bl.) Bl. Fl. Jav. Anon. (1830) 71 T. 33 and 36B. *Basonym: Unona sub-cordata* Bl. Bijdr. (1825) 15. *Ovules* 2 or more. *Seeds* 1–2, sometimes up to 5.

Section 2. *Monoon* Miq. in Ann. Mus. Bot. Lugd.-Bat. 2 (1865) 15. Several species there described. *Ovules* 1, usually erect, basal. (Contains most of the large leaved species and the taller trees.

DISTRIBUTION: Tropics of the Old World but especially numerous in S.E. Asia. The genus is one of the largest in the family and contains over 100 species. It is not easy to give an exact number of species without examining all *Polyalthia* species since many described as belonging to that genus have been incorrectly placed there and a certain number assigned to other genera must go to *Polyalthia*.

The genus is a large one but very uniform. It is one of the most successful in the family and is large because of its wide distribution. It is probably, too, one of the oldest genera. Hence we expect

to find quite a lot of groups in it having similar characters, e.g. such as axillary flowers, extra-axillary flowers, the cauliflorous habit, sessile and stalked carpels etc. and containing species differing very little from each other. This is exactly what we do get. If any one species has a wide distribution, e.g. *P. cauliflora* then we find it has a number of varieties and also one or two very closely related species such as *P. socia* and *P. lateritia.* Other examples of species related to each other are seen in these groups: 1. *P. sumatrana, P. hypoleuca, P. glauca* and *P. longifolia.* 2. *P. macropoda* and *P. clavigera.* 3. *P. stenopetala, P. angustissima* and *P. cinnamomea.* 4. *P. dumosa, P. suberosa* and *P. evecta.* 5. *P. parviflora* and *P. hirtifolia.* 6. *P. lateriflora* and *P. sclerophylla.* 7. *P. simiarum* and several species centred round it such as *P. asteriella, P. viridis* and *P. jucunda.* 8. *P. Jenkensii, P. Rumphii* and *P. flava.* 10. *P. Motleyana* and several species centred round it and so on.

Polyalthia may be looked on as the central genus of the *Unoneae.* Tagged on to it are various genera with a greater or less degree of relationship. *Desmos* and *Cananga* are offshoots. These two have spreading petals similar to *Polyalthia. Disepalum* is another near relative; the style has elongated, the stamens are not cuneate but linear and there has been a reduction in size and number of the petals. It is most logical therefore to regard the large genus *Polyalthia* as the central or basic one in the *Unoneae* and these others given here as offshoots or satellites of *Polyalthia.*

KEY

Section *Eu-Polyalthia*

a. Ovules 2 or more. Seeds 1–2 sometimes to 5

b. Flowers cauliflorous, axillary or from the axils of fallen leaves

c. Carpels sub-sessile, stalks 2–5 mm. long, pedicels short, 2 mm.–1 cm. long; petals narrow linear or filiform, 2·5–8 cm. long and 1–7 mm. broad

d. Leaves 5–23 cm. long, brown when dry; petals 4–8 cm. long

e. Petals 1–2 mm. broad; ripe carpels pubescent becoming glabrous

f. Ripe carpels 2–3 cm. long by 1·5–2·5 cm. broad; leaves 9–23 cm. long (1) **P. stenopetala**

f. Ripe carpels 1–1·5 cm. long by 7–8 mm. broad; leaves 5·5–8·5 cm. long (2) **P. angustissima**

e. Petals 7 mm.–1 cm. broad; ripe carpels brown-tomentose (3) **P. cinnamomea**

d. Leaves 19–28 cm. long, pale grey when dry, elliptic to oblanceolate with rounded and slightly cordate base; petals 2·5–2·7 cm. long (4) **P. pumila**

c. Carpels with stalks 1·5–2·5 cm. long, pedicels 1–4 cm. long, petals of various lengths and shapes but not narrow in proportion to length

g. Petals only 7 mm. long, margins revolute, fruit spherical not apiculate, brown when dry (5) **P. obliqua**

g. Petals 2 cm. long or over, margins not revolute, fruit ovoid, usually apiculate, black when dry

h. Main nerves 10–14 pairs, leaves entirely glabrous beneath; pedicels 1–1·3 cm. long

i. Leaves pale grey on both surfaces when dry; petals 4–4·5 cm. long (6) **P. lateritia**

i. Leaves pale grey above, greyish-brown beneath when dry; petals 2–3 cm. long (7) **P. socia**

h. Main nerves 8–10 pairs; leaves glabrous or pubescent beneath, brownish when dry, length and breadth variable; pedicels usually over 1·3 cm. (8) **P. cauliflora** and its vars.

j. Leaves average breadth 2 cm., glabrous or sparingly pubescent beneath var. **Beccarii**

j. Leaves average breadth 5–7·5 cm.

k. Petals 8 cm. long var. **Wrayi**

k. Petals 3·5–5·5 cm. long

l. Lower surface of leaves glabrous or slightly pubescent; carpels 1 cm. long and 7 mm. in diam. smooth, apiculate, 1–2 seeded with slender stalks 1·5 mm. thick **cauliflora typica**

l. Lower surface of leaves tomentose on midrib and nerves; carpels 1–1·5 cm. long and 1 cm. in diam., wrinkled when dry, not apiculate, 1–3 seeded, stalks 2·5 mm. thick var. **desmantha**

b. Flowers opposite the leaves or slightly below them or appearing terminal

m. Petals 6 mm.–1 cm. long; pedicels slender when present

n. Flowers on slender pedicels 1–3 cm. long; ripe carpels shortly stalked

o. Leaves lanceolate or oblong-lanceolate, acuminate; twigs dark brown or black, glossy, glabrous or with a few erect hairs (9) **P. dumosa**

o. Leaves oblong obtuse, twigs dark brown with numerous pink lenticels or sometimes corky outgrowths

p. Style present, stigma a triangular blade, connectives less than 1 mm. in diam. (10) **P. suberosa**

p. Style absent, stigma capitate, connectives 1 mm. in diam. or over (11) **P. evecta**

n. Flowers sessile or sub-sessile; ripe carpels sessile (sessile ? in *P. hirtifolia*)

q. Leaves elliptic-lanceolate, blunt apex, glabrous; petals coriaceous, fleshy (12) **P. parviflora**

q. Leaves lanceolate, acuminate, pubescent on midrib below; petals thin (13) **P. hirtifolia**

m. Petals 2–2·5 cm. long; pedicels stout when present

r. Leaves deeply cordate, auricled at base; young twigs covered with golden, erect 2–3 mm. long hairs (14) **P. bullata**

r. Leaves not or slightly cordate, not deeply so, not auricled; young twigs brown-pubescent or glabrous

s. Colour of leaves dark brown when dry, shining, glabrous; carpels stalks only 3–4 mm. long (15) **P. brunneifolia**

s. Colour of leaves not dark brown when dry, not shining, but glabrous or pubescent; carpels stalks 7 mm.–1·8 cm. long

t. Pedicels with a large rusty-tomentose bract 1·8–2 cm. long; ripe carpels 1·7 × 1·7 cm., obovate, lanose with hairs 5–6 mm. long, not apiculate (16) **P. chrysotricha**

t. Pedicels with 1–2 minute bracteoles; ripe carpels about 1 cm. long, ovoid, spherical, pubescent or subglabrous, apiculate
(17) **P. Motleyana** and its vars.

u. Pedicels 2–8 cm. long, average 4–5 cm.; leaves often minutely cordate at base var. **oblonga**

u. Pedicels 1 cm. or under, average 5–8 mm.; leaves narrower at base and scarcely or seldom cordate var. **glabrescens**

u. Flowers sessile or nearly so; leaves pubescent beneath, becoming glabrous var. **typica**

Section *Monoon*

a. Ovule solitary, usually basal, erect

v. Veins prominent, not parallel, not evenly curving but often crooked and interarching some distance from the margin. Flowers axillary. Carpels small, 5 mm.–1 cm. long, 1-seeded, slightly apiculate

w. Sepals sub-orbicular, slightly obtuse, 3 mm. long
(18) **P. Jenkensii**

w. Sepals triangular, acute 6 mm.–1·5 cm. long
(19) **P. Rumphii**

v. Veins prominent, nearly parallel, slightly curved or straight, and running out to the margin with interarching or line of interarching broken or indistinct. Flowers axillary or in fascicles on the older wood or on leafless twigs at base of trunk. Carpels large, 2 cm. long or more, oblong or cylindrical, 1-seeded.

x. Carpels oblong with an obtuse apex

y. Carpels sub-sessile (20) **P. pachyphylla**

y. Carpels stalks 2–5 cm. long

z. Petals narrow, linear, strap-shaped, 2 mm. broad
(21) **P. asteriella**

z. Petals strap-shaped, linear oblong or oblong-lanceolate, no distinction between blade and claw, 5 mm.–1 cm. broad

aa. Leaves, average length 30 cm. or over, coriaceous, oblong to elliptic-oblong with rounded or sub-cordate base; petals oblong-lanceolate 3·5–4·5 cm. long and 7 mm.–1 cm. broad
(22) **P. lateriflora**

aa. Leaves, average length 15–20 cm., coriaceous, oblong-ovate, with cuneate or rounded base; petals linear-oblong 4–4·5 cm. long and 5–8 mm. broad (23) **P. sclerophylla**

z. Petals obovate-lanceolate or oblanceolate, broadest above middle, blade and claw present

bb. Leaves obovate-elliptic or oblanceolate, reticulations not distinct above, nerves ascending, rather straight (24) **P. Hookeriana**

bb. Leaves oblong or elliptic-oblong, both surfaces very closely reticulate, nerves curving (25) **P. glabra**

x. Carpels cylindrical with a narrowed and pointed apex

cc. Flowers on long subterranean runners, or above the soil on runners, leaves rounded at base 20–36 cm. long; ripe carpels tomentose (26) **P. hypogaea**

cc. Flowers on short woody twigs or tubercles on main stem, leaves acute at base, 13–23·5 cm. long; ripe carpels glabrous, wrinkled when dry

dd. Flowers on short woody twigs; petals 4–4·5 cm. long; carpel stalks 5 mm. long (27) **P. macropoda**

dd. Flowers on tubercles; petals 2–2·5 cm. long; carpel stalks 2–3·5 cm. long (28) **P. clavigera**

v. Veins fine and faint, numerous, secondary not distinct from primary. Flowers axillary, single or in fascicles in the axils of fallen leaves. Carpels large, 1-seeded, from 1·5–3 cm. long

ee. Petals 3·5–4 cm. long and 3–4 mm. broad. Carpels ovoid, tapering to each end, slightly ridged when dry (29) **P. sumatrana**

ee. Petals 8 mm.–2 cm. long and 1–4 mm. broad. Carpels spherical, oblong or ovoid, obtuse at apex, not ridged

ff. Leaves sub-coriaceous, glaucous beneath

gg. Pedicels 2–5 mm. long. Carpels elliptic-oblong (30) **P. hypoleuca**

gg. Pedicels 1·5–4 cm. long. Carpels spherical (31) **P. glauca**

ff. Leaves, membranous, not glaucous beneath (32) **P. longifolia**

(1) **P. stenopetala** (Hk. f. et Th.) Ridley in Journ. Roy. As. Soc. Str. Br. 75 (1917) 6 et F.M.P. 1 (1922) 50 including *P. crinita* (Hk. f. et Th.) Ridley l.c.

Basonym: Unona stenopetala Hk. f. et Th. Fl. Ind. 1 (1855) 136; Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 60; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 298 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 61 Pl. 85.

Synonym: Unona crinita Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 61; King. Mat. F.M.P. Vol. 1 No. 4 (1892) 297 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 61 Pl. 84.

Tree 6–10 m. high. *Young twigs* densely rusty-tomentose, later glabrous, striate. *Leaves* thinly coriaceous, oblong-obovate or oblanceolate, acute or acuminate, narrowed below to the slightly cordate and oblique base, red when young, later dark green and shining above, drying brown, glabrous above except the midrib, rusty-pubescent on midrib and nerves beneath, the pubescence varying a good deal; main nerves 8–16 pairs, sunk above, raised beneath, curving, anastomosing doubly at margin; reticulations faint above, visible below, forming a loose open network; size rather variable even on the same twig, 9–23 cm. long, average length 14–18 cm.; breadth 4·5–7 cm.; petiole 3–4 mm. long, rusty-tomentose. *Flowers* densely fascicled from woody tubercles on the branches and trunk. *Pedicels* 6–7 mm. long, rusty-pubescent with a minute, acute, basal bract. *Sepals* 1–1·5 cm. long, membranous, narrow-lanceolate with broad base, sub-erect, pubescent on both surfaces, one prominent mid-vein and several smaller shorter laterals present. *Petals* red or brownish, linear, acute, subequal, 8–9·5 cm. long and 2 mm. broad, keeled, sparingly pubescent. *Stamens* 1·5–2 mm. long, rather broad with flat-topped or slightly convex connectives. *Ovaries* 4–7, 3 mm. long, angled, villose with sessile, obovoid stigma having a lateral groove on inner side. *Ripe carpels* red, sub-globose, often flattened at the apex, sometimes constricted between the seeds, rusty-tomentose, the tomentum varying in quantity and becoming less with age; length 2–3 cm.; breadth 1·5–2·5 cm.; stalks 2–5 mm. long. *Seeds* 1–5, bi-convex with grooved edge.

Distribution: Records from all the states except Perlis, Penang, Province Wellesley and Singapore. There is only one sheet from Johore, *Holttum S.F.N. 24932* in Herb. Singapore and it is rather doubtful. The type in Herb. Kew is *Lobb 414* and of *Unona crinita, Maingay 41*. This small tree is especially common in Perak, Pahang and Selangor. It is also found in Siam.

(2) **P. angustissima** Ridley in Journ. Roy. As. Soc. Str. Br. 54 (1910) 11 et F.M.P. 1 (1922) 53.

Slender tree up to 7 m. high. *Twigs* slender, striate, densely and shortly pubescent when young, glabrous when old. *Leaves* thin, papery, elliptic to elliptic-lanceolate, shortly acuminate, broadest across the middle, base rounded and unequal-sided, glabrous on both surfaces except for the sunk, pubescent midrib above, sparsely pubescent beneath on midrib and later glabrous, lower surface punctate with minute scales; nerves 8 pairs, indistinct above, faint below, interarching 3 mm. from edge; length 5·5–8·5 cm.; breadth 2–3·5 cm.; petiole 3 mm. long, pubescent. *Flowers* solitary, axillary or from the axils of fallen leaves. *Pedicels* 2 mm. long, pubescent with 1–2 minute pubescent bracts at the base. *Sepals* linear-lanceolate, acute, tawny-pubescent, 2–4 mm. long. *Petals* pink, linear, sparsely pubescent on both surfaces, dilate at the base, 4–5 cm. long and 1–1·5 mm. broad. *Stamens* 1 mm. long, few, top of connectives convex. *Ovaries* few, pubescent, stigma swollen, slightly pubescent. *Ripe carpels* slightly pubescent becoming glabrous, obtuse at both ends, 1–4 seeded with small constrictions indicating the number of seeds, 1–1·5 cm. long and 7–8 mm. in diam.; stalks 3–4 mm. long. *Seeds* pale brown. **Fig. 18.**

JOHORE: Sungei Semandan, *Corner, 16th June, 1934* (S.); Kuala Sembrong, *Lake* and *Kelsall 4047* (S., C.) type material.

SINGAPORE: Bukit Timah, *Ridley 8050* (S., Kew) type material; Changi, *Ridley 5917* (S., C.) type material; Gardens' Jungle, *Ridley 4813* (S., Kew) type material; *Ridley 13465* (S., Kew).

DISTRIBUTION: Confined to Johore and Singapore.

A small tree in deep shade. Several trees in the Botanic Gardens' Jungle and occasionally met with in the MacRitchie Reservoir Forest, Singapore. It seems to be confined to Johore and Singapore.

(3) **P. cinnamomea** Hk. f. et Th. Fl. Ind. 1 (1855) 138 et in Fl. Br. Ind. 1 (1872) 65; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 315 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 81 Pl. 114; Miq. Fl. Ind. Bat. 1 pt. 1 (1858) 44; Ridley, F.M.P. 1 (1922) 51; Craib, Fl. Siam. Enum. 1 (1925) 42.

Synonyms: Guatteria cinnamomea Wall. Cat. 6444 *nomen nudum* non *G. multinervis* Wall. Cat. 6445 (1832) = *P. Motleyana* var. *glabrescens* Airy-Shaw in Kew Bull. (1939) 282. *Unona cauliflora* Hk. f. et Th. Fl. Ind. 1 (1855) 137 et in Fl. Br. Ind. 1 (1872) 60. *P. velutinosa* Ridley in Journ. Roy. As. Soc. Str. Br. 59 (1911) 64 et F.M.P. 1 (1922) 56; Craib, Fl. Siam. Enum. (1925) 45.

Tree 8–20 m. high. *Young twigs* rusty-tomentose, later glabrous, coarsely striate. *Leaves* thinly coriaceous, oblong-lanceolate, acute or acuminate with rounded often unequal-sided base, glabrous and shining above, rusty-tomentose beneath on the midrib and pubescent on the nerves; main nerves 12–14 pairs, curving and leaving the midrib at nearly right angles, ascending gradually and anastomosing doubly at the margin, fine and sunk above,

Fig. 18. *Polyalthia angustissima* Ridley.
A. Flowering twig. B, Flower with petals detached. C, Stamen, front view. D, Stamen, back view. E, Gynoecium.

prominent beneath; reticulations faint or not visible above, forming a loose, open network beneath; length 12–27 cm.; occasionally up to 39 cm.; breadth 3·5–9 cm.; petiole rusty-tomentose, 2–7 mm. long. *Flowers* 1–3 from short woody tubercles on the older twigs or from axils of fallen leaves. *Pedicels* 3–5 mm. long, rusty-tomentose, bracteolate at the base. *Sepals* erect, membranous, several-veined, broadly ovate, acute, rusty-tomentose outside, puberulous to glabrous inside, 1·1 cm. long and 9 mm. broad. *Petals* dull red, coriaceous, linear, acute, slightly narrowed at the base, sub-equal, 5–9·5 cm. long and 7 mm.–1 cm. broad, channelled, having the edges inrolled, several-veined, pubescent except at the base inside. *Stamens* 1 mm. long, as in *P. stenopetala*. *Ovaries* 3 mm. long, similar to those of *P. stenopetala*. *Ripe carpels* densely clustered, pyriform, obtuse, 2–2·5 cm. long and 1·2–1·5 cm. in diam., rusty-tomentose; stalks 2–3 mm. long. *Seeds* 2–3, plano-convex.

LOWER SIAM: Banang Sta, *Kiah S.F.N. 24318* (S., K., Kew).

KEDAH: Gunong Raya, Langkawi, *Haniff 15552* (S., Kew) = *Ridley's type of P. velutinosa; Corner S.F.N. 37880* (S., Kew); *Haniff* and *Nur S.F.N. 7141* (S., C., Kew); Langkawi, *Dolman 21487* (S., Kew); 48th mile Jeniang Road, *Kiah S.F.N. 36000* (S., K., Kew); Koh Mai F.R., *Kiah S.F.N. 35168* (S., K., Kew); Perangin F.R., *Awang 20683* (K.).

KELANTAN: Sungei Keteh, *Nur* and *Foxworthy 11994* (S., K., Kew); Bukit Kwang, *Walton 29090* (K.).

PENANG: Pulau Boetong Reserve, *Curtis 2470* (S., C., Kew).

TRENGGANU: 36th mile Trengganu-Besut Road, *Sinclair S.F.N. 39939* (S.).

PAHANG: Bibut F.R., Raub, *Syed Ali 23553* (K.); Kemansul, *F. Guard Browne 40736* (K.); Titi Bungor, Temerloh, *Henderson F.M.S. Mus. 10635* (S.).

SELANGOR: 12th mile Ginting Simpah, *Strugnell 13079* (K.); Weld Hill Reserve, *Hashim 284* (K.); *Symington 43629* (K.); *Hamid* (*Cubitt's* collector) *C.F. 888* and *C.F. 68* (S., K.); *Abdul Raman C.F. 604* (K.); Sungei Lalang, Kajang, *Symington 24226* (S., K.).

NEGRI SEMBILAN: Sri Menanti, *Charter 21408* (S., K.).

MALACCA: *Maingay 37* (C., Kew); Selandor, *Alvins 466* (S.); Merlimau, *Derry 898* (S., C.).

JOHORE: Pulau Aor, *Henderson S.F.N. 18216* (S.).

DISTRIBUTION: Siam and Malaya.

A species resembling *P. stenopetala* in several points. The stamens and ovaries are very similar but the petals are much broader, 7 mm.–1 cm. instead of only 2 mm. The carpels are pyriform, more numerous and slightly smaller. Regarding the leaves, confusion is likely to arise in sterile material. The leaves of *P. cinnamomea* are generally larger and narrower, not cordate at the base and less unequal-sided. When dry they have a silvery-brown colour beneath while those of *P. stenopetala* are a medium brown.

The type of *P. velutinosa* Ridley, *Haniff 15552* is identical with *P. cinnamomea* so it has been reduced. *Nur 11127* from Bukit Fraser, 28th August, 1923 mentioned by Airy-Shaw in Kew Bull. (1939) 282 as an additional record of *P. velutinosa* is *P. chrysotricha* Ridley. Type of *P. cinnamomea* in Herb. Kew is *Lobb, Wall. Cat. 6444.*

(4) **P. pumila** Ridley in Journ. Roy. As. Soc. Str. Br. 54 (1910) 12 et F.M.P. 1 (1922) 53.

Shrub only about 30 cm. tall. *Young twigs* at first densely dark brown-tomentose, later striate, glabrous, dark coloured. *Leaves* coriaceous, broadly elliptic to oblanceolate, acuminate, broadest across the middle, narrowed to the rounded, slightly cordate and unequal-sided base, upper surface smooth, glabrous but midrib sometimes slightly pubescent at the base, lower surface pale when dry, minutely punctate with brown circular scales, visible under a lens, glabrous with a few scattered hairs on the midrib and nerves when young; nerves about 15 pairs, sunk above, prominent beneath, rather straight, interarching about 5 mm. from the margin, the line of interarching prominent; reticulations indistinct and not raised, rather close; length 19–28 cm.; breadth 6·5–10 cm.; petiole 3–5 mm. long, stout, tomentose. *Flowers* axillary; pedicel 4–5 mm. long, stout, brown, pubescent, decurved with 2 minute pubescent bracts at the base. *Sepals* 1–1·2 cm. long, thin, broadly triangular, acute, brown-pubescent on outside, slightly pubescent inside. *Petals* orange, outer 2–2·7 cm. long and 5 mm. broad, strap-shaped, acute, pubescent on the outside, glabrous on the inside, inner slightly longer and narrower, 2·5–3·8 cm. long. *Stamens* 2 mm. long with convex-topped connectives, not very numerous. *Young ovaries* 3 mm. long, about 15, silky-pubescent with pubescent stigma. *Carpels* immature, ovoid, apiculate, pubescent; stalk very short, 2 mm. long.

Perak: Telok Sera, Dindings, *Ridley 7996* (S., Kew) type material.
Johore: Gunong Janing, *Lake* and *Kelsall, 20th October, 1892* (S.) type material.
Distribution: No other records.

Distinct. Rare. The smallest Malayan *Annonaceous* plant. In the American genus *Annona* there are however several species which do not reach a metre in height. *Annona pygmaea* from Brazil is a dwarf shrub 10 cm. or less high. *A. campestris* from Paraguay is 10–50 cm. high. Other dwarf members are *A. aurantiaca,* Brazil 30 cm., *A. glaucophylla,* Brazil and Paraguay 30–50 cm., *A. crotonifolia,* Brazil and Paraguay 50–60 cm. and *A. paraguayensis,* 60–80 cm.

(5) **P. obliqua** Hk. f. et Th. Fl. Ind. 1 (1855) 138 et in Fl. Br. Ind. 1 (1872) 67; Miq. Fl. Ind. Bat. 1 Pt. 1 (1858) 44; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 312 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 77 Pl. 100 B; Ridley, F.M.P. 1 (1922) 55.

Slender tree 7–10 m. high. *Young twigs* reddish, with numerous lenticels, minutely pubescent, soon glabrous. *Leaves* thinly coriaceous, oblong-lanceolate, shining above, dull beneath, drying silvery-green, edges very slightly revolute, apex acute, base narrowed and unequal-sided; main nerves 11–14 pairs, faint above, prominent beneath, curving and leaving the midrib at a wide angle, anastomosing doubly; reticulations prominent below with a loose net-work; length 11–20 cm.; breadth 4–7 cm.; petiole very short, 3–5 mm. long, swollen. *Flowers* 1–3 in the axils of leaves or fallen leaves. *Pedicels* about 1 cm. long, pubescent with 2 minute bracts, one basal and the other medial. *Sepals* broadly triangular, slightly obtuse, pubescent outside, glabrous inside, 2 mm. long. *Petals* white, the inner with a rosy flush at the base, oblong, obtuse, the edges revolute, pubescent outside, glabrous and rough on the inside, 7 mm. long. *Stamens* 1 mm. long with flat-topped or convex connectives. *Ovaries* 1·5 mm. long, angled, pubescent; stigma pubescent. *Ripe carpels* glabrous, spherical, thin-walled, 2 cm. long; stalks 1·5 cm. long. *Seeds* 2.

KELANTAN: Gua Ninik, *Henderson S.F.N. 19649* (S., K.); Bukit Batu Papan, S. Lebir, *Henderson S.F.N. 29554* (S., K., Kew).

PAHANG: Bukit Goh F.R., Kuantan, *Foxworthy C.F. 3135* (S.); Tembeling, *Henderson S.F.N. 24809* (S., K., D.D., Kew) and *21799* (S., K.); *Holttum S.F.N. 24706* (S., K.); Belingoo, Temerloh, *Awang Lela 2669* (S.); Jerantut, *Burkill* and *Haniff S.F.N. 16052* (S., Kew); Simpam River near Raub, *Burkill* and *Haniff S.F.N. 16810* (S.); Sungei Bibut F.R., Raub, *Osman 28422* (K.); Rotan Tunggal, Raub, *Osman 29280* (K.).

SELANGOR: Bukit Enggang, Kajang, *Symington 24197* (S., K.).

MALACCA: *Alvins 2375* (S.); *Griffith 416* (C., Kew) type material; *Maingay 44* (C., Kew).

DISTRIBUTION: Chittagong Hill Tracts. Borneo.

Easy to recognize by the subsessile leaves. *P. subsessiliflora* Bak. f. from Sumatra resembles the present species but its pedicels are much shorter.

(6) **P. lateritia** J. Sinclair, **sp. nov.**

Haec species in floribus *P. caulifloram* Hk. f. et Th. revocat sed pedicellis brevioribus, foliis omnino glabris basi emarginatis, nervis pluribus, petiolis brevioribus recedit. *P. obliqua* Hk. f. quae folia basi emarginata etiam habet, petalis multo brevioribus et late oblongis differt.

Frutex vel *arbor* parva ad 3–13 m. alta. *Ramuli* pallido-grisei, glabri cum lenticellis numerosis. *Folia* 9–26 cm. longa, 3·5–7·5 cm. lata, chartacea, pallido-grisea in sicco, utrinque omnino glabra, elliptica vel oblongo-elliptica, acuminata, basi emarginata, saepe paulo inaequilateralia; nervi 10–14 pares, curvati arcuatim adscendentes, 5 mm. a margine anastomosantes, nitidi, supra leviter depressi, subtus elevati; reticulationes laxae; petioli breves, 2–3 mm. longi. *Flores* axillares vel ex tuberculis ramulis veterioribus orti. *Pedicelli* 1 cm. longi, tenuiter pubescentes, apicem versus sensim crassiores, basi minute bracteolati. *Sepala* 4 mm. longa, ovata, acuta, extus et margine pubescentia. *Petala* 4–4·5 cm. longa, 7–8 mm. lata, subaequalia, oblongo-lanceolata, acuta, coriacea in colore lateritia vel flavo-rubra, extus leviter pubescentia, intus glabra. *Stamina* 2 mm. longa, numerosa; connectiva apicibus convexa. *Ovaria* numerosa, pubescentia, angulosa, 2 mm. longa. *Fructus* non visus.

KELANTAN: Sungei Keteh, Batu Bow, *Nur* and *Foxworthy S.F.N. 12063* (S.).

PERAK: Waterloo New Road, *Curtis 2704* holotype (S.); Ipoh, *Curtis 3173* (S.); Gopeng, Kinta, *King 7105* (C., Kew); *King 10964* (C.).

PAHANG: Tahan River, *Mat, 29th March, 1893* (S.).

MALACCA: Sungei Ujong, *no data* (S.); *Maingay 51* (Kew).

DISTRIBUTION: Not known outside the Peninsula.

The leaves dry a silvery grey. They are emarginate at the base as in *P. obliqua* but the flowers resemble those of *P. cauliflora*. I have not seen any fruit.

(7) **P. socia** Craib in Kew Bull. (1925) 10; Fl. Siam. Enum. 1 (1925) 44.

Tree about 5 m. high. *Young twigs* glabrous, reddish, closely striate. *Leaves* oblong-lanceolate or oblanceolate, apex a short point, somewhat obtuse, base rounded, emarginate, papery, glabrous, drying silvery above and greyish-brown beneath; main nerves 11–14 pairs, fine and not very distinct above, slightly prominent beneath, anastomosing at margin; reticulations faint on both surfaces; length 12–16 cm.; breadth 3·5–6 cm.; petioles 4 mm. long, stout, dark coloured. *Flowers* pale green (ex Kerr et Kiah quoad spec. Siam.), axillary?, arising on short tubercles; pedicels 1–1·3 cm. long, rough, thicker towards the base of calyx. *Sepals* deltoid, shortly acuminate, ciliate 1·25 mm. long and 2·5 mm. broad. *Petals* sub-equal, lanceolate, acute, about 2–3 cm. long and 6 mm. broad, finely veined (about 5 veins), these being more prominent on the outside, a few sparse adpressed hairs outside, glabrous inside and

slightly rough at base. *Stamens* 1·75 mm. long, connectives flat-topped and rhomboid by compression. *Ovaries* 1·5 mm. long, adpressed-pilose, with two ovules. *Ripe fruit* not seen.

LOWER SIAM: Pattani, *Kerr 7101* (Herb. Bangkok) type; *Prit 3637* (Herb. Bangkok); Bacho, *Kiah S.F.N. 24291* (S., K., Kew).

Nur and *Kiah S.F.N. 7773* from Gunong Pulai, Johore is very similar to *P. socia* and probably is the same. The leaves however are narrower at the base and not emarginate. The flowers are yellow outside and red inside.

P. socia is distinguished from *P. cauliflora* by having more nerves, 11–14 pairs instead of 8–10. The flowers are not cauliflorous and the petals are shorter.

(8) **P. cauliflora** Hk. f. et Th. Fl. Ind. 1 (1855) 138 et in Hk. f. F.B.I. 1 (1872) 66; King in Ann. Roy. Bot. Gard. Calc. 4 (1893) 84 Pl. 116; Ridley in Journ. Roy. As. Soc. Str. Br. 75 (1917) 6; F.M.P. 1 (1922) 51; Craib, Fl. Siam. Enum. 1 (1925) 41; Airy-Shaw in Kew Bull. (1939) 282.

Synonyms: Uvaria cauliflora Wall. Cat. 6476 (1832) *nomen nudum. Unona pycnantha* Hk. f. in Fl. Br. Ind. 1 (1872) 60; *Polyalthia pycnantha* King, Mat. F.M.P. Vol. 1 No. 4 (1892) 316 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 83 Pl. 116 Bis. *Guatteria Teysmannii* Miq. Fl. Ind. Bat. Suppl. (1861) 378. *Monoon Teysmannii* (Miq.) Miq. in Ann. Mus. Bot. Lugd.-Bat. 2 (1865) 19. *Guatteria* ? *palembanica* Miq. Fl. Ind. Bat. Suppl. (1861) 379 teste Miq. in Ann. Mus. Bot. Lugd.-Bat. 2 (1865) 19. *Polyalthia macrorhyncha* Miq. in Ann. Mus. Bot. Lugd.-Bat. 2 (1865) 13; Boerl. in Icon. Bog. 1 (1899) 108.

Shrub or small tree. *Twigs* slender, pale cinereous, glabrous except the young ones, lenticellate. *Leaves* slightly coriaceous, glabrous above, shining, slightly pubescent on the midrib and nerves beneath, becoming glabrous, elliptic, elliptic-lanceolate or broadly elliptic, acuminate, base acute or slightly rounded; nerves 8–10 pairs, slightly depressed above, prominent beneath, curving and forming a double series of arches near margin; reticulations faint above but prominent and forming a loose network on lower surface; length varying from 9–20 cm. but average about 15 cm.; breadth also variable 4–8 cm., average 5–6 cm.; petiole 5–7 mm. long, pubescent. *Flowers* arising mostly from woody tubercles on the trunk and branches, less often from the axils of fallen leaves. *Pedicels* 2–4 cm. long, slender, varying in length according to age, adpressed-pubescent, minutely bracteolate at the base, woody when bearing fruit. *Sepals* triangular or ovate-triangular, slightly

pubescent outside and on the margins, 6–7 mm. long. *Petals* cream to pinkish-brown, varying in colour and size with age; outer when mature 3·5–5·5 cm. long and 8 mm.–1 cm. broad; inner slightly longer; both sets coriaceous, apices acute, curving inwards, slightly channelled on upper surface, minutely adpressed-pubescent outside, the degree of pubescence varying, glabrous inside. *Stamens* numerous, 1·5–2 mm. long; filaments a quarter the length of whole stamen; connectives flat-topped, hexagonal. *Ovaries* numerous, closely packed, 1–2 mm. long, pubescent, slightly angled, grooved on inner surface; stigma pubescent, sessile, slightly angled or subglobose. *Ripe carpels* numerous ovoid, glabrous or slightly pubescent, granular, slighty mucronate, 1 cm. long and 7 mm. in diam; stalks slender, adpressed-pubescent, 2–2·5 cm. long. *Seeds* 1–2 **Fig. 19.**

Fig. 19. *Polyalthia cauliflora* Hk. f. et Th.

A, Leafy twig. B, Flowers and Fruit. C, Outer petal. D, Inner petal. E, Stamen, front view. F, Stamen, back view. G, Gynoecium.

PERAK: Pulau Pankore, *Curtis 1645* (S.); *Ridley 7989* (S., Kew); Lumut, *Curtis 1383* (S., Kew) and *Ridley, July 1898* (S.); Telok Sera, Dindings, *Ridley 7995* (S.).

PAHANG: Ulu Serau, *Osman 28306* (S., K.); Tahan River, *Ridley, August 1891* (S.) and *Mat, date 1893* (S.); Sungei Telom, *Kiah* and *Strugnell S.F.N. 24016* (S., K.); Bukit Baserah, *Soh 15078* (S., K.).

SELANGOR: Senawang F.R., *Holttum S.F.N. 3957* (S.); Bukit Sutu, *Alvins 1598* (S.); Perhentian Tinggi, *Ridley, December 1898* (S.).

MALACCA: Panchor, *Goodenough 1746* (S.); Brisu, *Derry 401* (S.); Selandor, *Alvins 438* (S.).

JOHORE: Gunong Panti, *Ridley, 8th December, 1892* (S., K.); Bukit Tinjau Laut, *Corner S.F.N. 36941* (S., K., Kew) and *S.F.N. 37069* (S.); Sednak, *Ridley 13515* (S., C., Kew) and *13517* (S., Kew); Tengarah, *Lake* and *Kelsall, 27th October, 1892* (S., K.); Kuala Sembrong, *Lake* and *Kelsall 4045* (S., C.).

SINGAPORE: Bukit Timah, *Ridley 8117* (S.) and *8113* (S., Kew); *Goodenough, 12th August, 1889* (S.); Bukit Panjang, *Mat, date 1894* (S.); Toas, *Ridley, date 1894;* Changi, *Ridley 5980* (S., C.); Chan Chu Kang, *Ridley 6231* (S., C.) and *4710* (S., C.); *Goodenough, 15th February, 1893* (S., C.).

The above description applies to the species in the sensu stricto. *P. cauliflora* is of wide distribution in Malaya but is less common in the north. In the broad sense it is very variable, which owing to its wide distribution is to be expected. I agree with Airy-Shaw in including certain other species in it but here have made some of them varieties. Those included are var. *Beccarii*, var. *desmantha* and var. *Wrayi* which formerly were species.

P. cauliflora var. **Beccarii** (King) J. Sinclair, **stat. nov.**

Polyalthia Beccarii King, Mat. F.M.P. Vol. 1 No. 4 (1892) 314 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 81 Pl. 110 B; Ridley in Sarawak Mus. Journ. 1 No. 3 (1913) 80 et F.M.P. 1 (1922) 50. Included in *P. cauliflora* by Airy-Shaw, Kew Bull. (1939) 282.

Leaves narrower than in typical *P. cauliflora,* 8–13 cm. long and 1–3·5 cm. broad, average breadth 2 cm., glabrous beneath but sometimes slightly pubescent on the midrib and larger veins; reticulations often but not always less prominent. *Petals* varying in length, average 3 cm. *Fruit* as in the typical form.

KELANTAN: Sungei Keteh, *Nur* and *Foxworthy S.F.N. 12010* (S., K., Kew); Gua Ninik, *Henderson S.F.N. 19672* (S.) somewhat intermediate between type and var. *Beccarii.*

PERAK: *Scortechini Nos. 2108* (S., C., Kew); *1882* (S., C.); *88b* (S., C.); *King 7803* (C., Kew); Sungkai, *King 3026* (S., C., Kew); Gopeng, Kinta, *King 4522* (C., D.D., Kew) and *793* (C., Kew); Larut, *King 4403* (C., E., Kew); Tapah, *Wray 495* (S., C., Kew) and *181* (C., E.); *14099* probably collected by *Ridley* (S., Kew); Lumut, *Ridley Nos. 3094* (S.); *10320* (S.) somewhat intermediate; Kota Lama, Kuala Kangsar, *Haniff S.F.N. 16046* (S.); Murah F.R., Dindings, *Strugnell 27090* (K.) intermediate form.

TRENGGANU: Sungei Nipah by Jeram Gajah, Kemaman, *Corner, 20th November, 1935* (S.); Ulu Bendong Kajang, Kemaman, *Corner S.F.N. 30015* (S.); Sungei Paka, *Symington 26845* (K.).

PAHANG: Rompin, *Soh 15457* (S., K.); Chini Reserve, *Watson 3177* (S., K., Kew) somewhat intermediate; Gunong Tapis, Kuantan, *Symington* and *Kiah S.F.N. 28912* (S., K.); Temerloh, *Burn-Murdoch 154* (S.); Ulu Pekin, *Ja'amat 16540* (K.); Bukit Kajang F.R., Raub, *Strugnell 22309* (K.) intermediate; Trasang F.R., Raub, *Strugnell 22302* (K.); Batu Talam, Raub, *Kalong 20492* (K.).

NEGRI SEMBILAN: Gemas, *Burkill S.F.N. 6384* (S., Kew) and *S.F.N. 4967* (S., Kew); Gunong Angsi, *Nur S.F.N. 11672* (S., C., K.); *2136* probably *Alvins, no exact loc.* (S.) intermediate form.

MALACCA: Bukit Sedanan, *Holttum S.F.N. 9684* (S., K.).

JOHORE: Gunong Janing, *Lake* and *Kelsall, date 1892* (S.); Tebing Tinggi, *Ridley 11057* (S.); Sungei Kayu, *Kiah S.F.N. 32069* (S.); *14th* mile Mawai-Jemaluang Road, *Corner S.F.N. 29026* (S., K., Kew) approaching typical *P. cauliflora;* Gunong Panti, *Holttum S.F.N. 17490* (S.); Ridley, *December 1892* (S.) somewhat intermediate with narrow and broad leaves.

SINGAPORE: Bukit Timah, *Ngadiman S.F.N. 34933* (S., K., Kew) somewhat intermediate. The typical *P. cauliflora* occurs in B. Timah.

DISTRIBUTION: Borneo and Sumatra. Type material = Perak specimens, *Wray, King* and *Scortechini; Beccari 401* Sumatra and *Motley 743* Borneo.

I have separated from the broader leaved typical *P. cauliflora* the sheets here quoted. They include the sheets of *King, Scortechini* and *Wray* collected in Malaya and agree with *King's* description and plate of *P. Beccarii* [Ann. Roy. Bot. Gard. Calc. 4 (1893) Pl. 110 B]. The majority of the sheets have much narrower leaves than *P. cauliflora* but there are several with leaves intermediate between the two forms while sometimes the same twig may have broad and narrow leaves. I agree with Airy-Shaw that *P. Beccarii* is not specifically distinct from *P. cauliflora* but these narrow leaved forms are recognizable and I prefer for convenience in grouping to give them varietal rank, reducing *P. Beccarii* to a variety of *P. cauliflora.*

P. cauliflora var. **desmantha** (Hk. f. et Th.) J. Sinclair, **stat. nov.**

Unona desmantha Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 61; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 297 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 60 Pl. 83. *Desmos desmanthus* Safford in Bull. Torr. Bot. Club 39 (1912) 508. *Polyalthia desmantha* Ridley in Journ. Roy. As. Soc. Str. Br. 75 (1917) 6 et F.M.P. 1 (1922) 49; Airy-Shaw Kew Bull. (1939) 282 included in *P. cauliflora.*

Young twigs densely brown-tomentose. *Leaves* as in *P. cauliflora* with the base slightly more rounded but differing chiefly in the more tomentose midrib and veins of the lower surface; veins and

reticulations very distinct and raised on lower surface; average breadth of leaf 6–7·5 cm. *Flowers* as in the type. *Ripe carpels* larger than in *P. cauliflora,* 1–1·5 cm. long and 1 cm. in diam. not apiculate, the surface very much wrinkled when dry; 2–3 seeded; stalks stouter than in the type and the other varieties.

LOWER SIAM: Kopah Bankrap, *Haniff* and *Nur S.F.N. 2722* (S., C., Kew).

PENANG: Penang Hill, *Ridley 7022* (S.).

PROVINCE WELLESLEY: Tasek Glugor, *Burkill S.F.N. 6534* (S., K., Kew).

PERAK: Telok Sera, Pankore, *Curtis 1644* (S.); Larut, *King 7617* (C., Kew) and *3113* (C., Kew); Piah F.R., *Ja'amat 39314* (K.); Upper Perak, *Wray 3870* (D.D.).

PAHANG: Near Sungei Teku, *Kiah S.F.N. 31771* (S., K., Kew); Kuala Rompin, *Seimund F.M.S. Mus. Herb. 967* (S.); Buloh Telang, P. Tioman, *Nur S.F.N. 18585* (S., K.).

NEGRI SEMBILAN: Bukit Plangi, Tampin, *Nur S.F.N. 2542* (S.); Tampin Hill, *Nur S.F.N. 794* (S.).

MALACCA: *Alvins 2220* (S.); *Maingay 48* (C., Kew) type of *desmantha* and a duplicate sheet is type of *pycnantha;* Ayer Panas, *Goodenough 1538* (S.).

JOHORE: Bukit Lenggor, *Holttum S.F.N. 24926* (S., K., Kew); 12th mile Mawai-Jemaluang Road, *Corner S.F.N. 28684* (S., K., Kew); Mawai, *Ngadiman S.F.N. 34739* (S., K.); Kangka, Sedili Ketchil, *Corner S.F.N. 28600* (S., Kew) and *S.F.N. 28601* (S., K., Kew); Sungei Kayu, *Kiah S.F.N. 32101* (S., K., Kew) and *S.F.N. 32125* (S., K., Kew); North of Gunong Belumut, *Holttum S.F.N. 10603* (S.); Sungei Rhu Reba, Jason Bay, *Corner S.F.N. 28503* (S., K., Kew); Sungei Berassau, S. Sedili, *Corner S.F.N. 25978* (S., K., Kew); Pantai F.R., Compt. 1, *Symington 35754* (K.).

DISTRIBUTION: Siam, Borneo and Sumatra.

I have sorted out the above quoted series with longer wrinkled fruits and more pubescent leaves but do not reckon them to be distinct enough from *P. cauliflora* to be a separate species so reduce them (*P. desmantha*) to *P. cauliflora* var. *desmantha. Guatteria Teysmannii* Miq. is probably *P. cauliflora* var. *desmantha* rather than *P. cauliflora* sensu stricto.

P. cauliflora Hk. f. et Th. var. **Wrayi** (Hemsl.) J. Sinclair, **stat. nov.**

Unona Wrayi Hemsl. in Hk. f. Icon. Pl. 16 (1887) T. 1553; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 296 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 60 Pl. 82; Ridley, F.M.P. 1 (1922) 49.

Leaves pubescent on the midrib and veins below as in var. *desmantha* but slightly less so and the base more rounded. *Flowers*

cauliflorous with petals 8 cm. long. *Ripe carpels* pinkish, ovoid or oblong, about 2·5 cm. long; stalks glabrous, 1·5 cm. long.

PERAK: Upper Perak, *Wray* no number quoted, 2 sheets. (S.) type material; Ulu Kenering, *Wray 660* (S., Kew) type material.

This differs from *P. cauliflora* and its other varieties by the much longer petals. It is nearest to var. *desmantha* but I have kept it separate owing to the very limited number of sheets at my disposal.

(9) **P. dumosa** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 301 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 64 Pl. 86A; Ridley, F.M.P. 1 (1922) 54.

Shrub. *Young twigs* slender, dark red, with a few sparse, erect 1 mm. long hairs, soon glabrous and finely striate. *Leaves* rather crowded, thinly coriaceous, lanceolate or oblong-lanceolate, acuminate, base rounded and minutely emarginate, glabrous, the lower midrib occasionally sparsely pubescent, both surfaces dull, drying greyish; main nerves about 12 pairs, very fine, faint above, more distinct beneath, leaving the midrib at nearly right angles, anastomosing 3 mm. from margin; reticulations not visible above, faint and lax beneath; length 7–13 cm.; breadth 1·5–4·5 cm.; petiole 2 mm. long. *Flowers* solitary, opposite the leaves on a slender, glabrous 1·1–3 cm. long pedicel with a small lanceolate bract about the middle. *Sepals* ovate, acuminate, spreading, 3–4 mm. long. *Petals* orange, leathery, sub-equal, 8 mm. long, oblong-lanceolate, acuminate, glabrous outside, puberulous inside. *Stamens* 1 mm. long, numerous, the connectives rhomboid, slightly convex hiding the anther cells. *Ovaries* few, oblong, pubescent with broad sessile, pubescent stigma. *Ripe carpels* 1–2, ovoid-globose, glabrous, red, 1 cm. long and 8 mm. in diam., rough; stalks 2 mm. long. *Seeds* 1–2.

PERAK: Waterfall Hill, *Wray 2628* (S., C.) type material; Maxwell's Hill, *Wray 2978* (S., Kew) type material; *Scortechini 601* (S., C., Kew) type material.

TRENGGANU: Gunong Padang, *Moysey* and *Kiah S.F.N. 33947* (S.).

DISTRIBUTION: Not known as yet from other localities.

A rare species. The leaves recall those of *P. cauliflora* var. *Beccarii* but they are proportionally longer and narrower. The flower is totally different being opposite the leaves. *P. dumosa* is near *P. suberosa* but the venation is different, the carpels fewer and the bark not hypertrophied.

(10) **P. suberosa** (Roxb.) Thwaites, Enum. (1864) 398; Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 65; King in Ann. Roy. Bot. Gard. Calc. 4 (1893) 64 Pl. 77B; Craib, Fl. Siam. Enum. 1 (1925) 44; Ast in Suppl. Fl. Gén. de L'Indo-Chine T. 1 fas. 1 (1938) 74.

Basonym: Uvaria suberosa Roxb. Cor. Pl. 1 (1795) 31 T. 34.

Synonym: Guatteria suberosa Dunal, Monog. Anon. (1817) 128; Hk. f. et Th. Fl. Ind. 1 (1855) 140.

Shrub. *Young twigs* rusty-pubescent, later glabrous, dark red and with pink lenticels, the old ones with corky ridges. *Leaves* membranous, oblong or oblong-lanceolate, obtuse, the base narrowed and slightly unequal-sided, glabrous above, slightly pubescent beneath on the midrib and veins, grey above or pale brown beneath when dry; main nerves about 8–10 pairs, spreading, faint on both surfaces as are the lax reticulations; length somewhat variable, 5–11 cm.; breadth 2–4 cm.; petiole 1–3 mm. long. *Flowers* solitary, extra-axillary, opposite the leaves or slightly below them, on slender 7 mm.–2·5 cm. long, puberulous pedicels with a minute, acute bract near base. *Sepals* ovate, acute, pubescent outside, glabrous inside, 2–2·5 mm. long. *Petals* reddish-brown, coriaceous, slightly pubescent outside, glabrous inside, the outer oblong-lanceolate, acute, slightly reflexed, 6 mm. long; the inner oblong, obtuse, erect 1 cm. long. *Stamens* numerous 1 mm. long with convex connectives. *Ovaries* 2 mm. long, pubescent; style present widening into a thick triangular, blade-like, glabrous stigma. *Ripe carpels* glabrous, spherical, 5 mm. in diam.; stalks slender, 8 mm.–1 cm. long. *Seeds* 1–2 with a longitudinal circumferential band.

LOWER SIAM: Banglapham, *Keith 35* (S.).
KELANTAN: Banchok, *Corner S.F.N. 33522* (S.).
DISTRIBUTION: Bengal, Burma, South India, Ceylon, Siam, Indo-China and Hainan.

A rare species in Malaya but common in India. Very near *P. evecta* (See notes under that species). Type in Herb. Kew is *Wall. Cat. 6437,* Burma.

(11) **P. evecta** (Pierre) Finet et Gagnep. in Bull. Soc. Bot. Fr. Mém. 4 (1906) 91 et Fl. Gén. de L'Indo-Chine 1 (1907) 69; Craib, Fl. Siam. Enum. (1925) 42; Ast in Suppl. Fl. Gén. de L'Indo-Chine T. 1 fas. 1 (1938) 74.

Basonym: Unona evecta Pierre Fl. For. Cochinch. (1880) T. 31.

This species if sterile or in fruit is very similar to *P. suberosa.* The chief and distinguishing character is found in the flower. The

stigma is sessile and capitate while in *P. suberosa* a definite style and a triangular blade-like stigma are present. *In P. evecta* the stamens are fewer and longer, 1·5 mm. long and they have a larger, orbicular flat-topped connective (1 mm. in diam.). The inner petals are slightly shorter, 6–8 mm. long. The petioles and midrib tend to be more pubescent but not always. Whether *P. evecta* has the corky hypertropied bark of *P. suberosa* on its older branches, I do not know but I have seen no sign of this on herbarium sheets examined.

LOWER SIAM: Bang Son, *Haniff* and *Nur 4393* (S., Kew); Koh Lak, Lajburi, South-west Siam, *Hamid C.F. 3802* (S., K., Kew); Hat Sunuhor, Lajburi, *Hamid C.F. 3820* (S.).

DISTRIBUTION: Siam and Indo-China. Type in Herb. Kew is *Pierre 824*, Cambodia.

(12) **P. parviflora** Ridley in Journ. Roy. As. Soc. Str. Br. 61 (1912) 46; F.M.P. 1 (1922) 54 pro parte; Craib, Fl. Siam. Enum. 1 (1925) 43. [Altera pars see page 323, and Craib page 43].

Synonym: P. rufa Craib in Kew Bull. (1924) 82.

Small tree. *Young twigs* minutely pubescent, becoming glabrous, dark coloured, striate. *Leaves* thin, elliptic-lanceolate, apex blunt, the base narrowed, rounded and unequal-sided, glabrous except the petiole; nerves 8–10 pairs, scarcely visible above but distinct beneath, curving first, then ascending steeply, anastomosing 5 mm. from margin; reticulations faint and lax; length 7–11 cm.; breadth 2·5–4 cm.; petiole pubescent. *Flowers* subsessile, on a hairy, 2 mm. long pedicel. *Sepals* ovate, acute, 3 mm. long with hairs 1 mm. long at margins and apex. *Petals* 6 mm. long and 2 mm. broad, white, oblong-lanceolate, acute, coriaceous, fleshy, hairy outside, hairs 1 mm. long, glabrous inside. *Stamens* numerous 1 mm. long with flat-topped connectives. *Ovaries* 1 mm. long, pubescent. *Ripe carpels* sessile, about 12, obovoid, minutely apiculate, with a tuft of adpressed hairs round the apiculus, length 8 mm.; diam. 5–6 mm. *Seeds* 1–2.

PERLIS: Kaki Bukit, *Kiah S.F.N. 35269* (S.).

KEDAH: Pulau Tengah, Langkawi, *Ridley 15893* (S., Kew) type material; Langkawi at Kuala Malacca, *Curtis 2533* (S., C.) type material.

DISTRIBUTION: Siam.

The sessile flowers and carpels are the best diagnostic characters.

(13) **P. hirtifolia** J. Sinclair, **nom. nov.**

Synonym: P. hirta Ridley in Journ. Roy. As. Soc. Str. Br. 82 (1920) 168; F.M.P. 1 (1922) 54 non *P. hirta* (Miq.) Diels in Engl. Bot. Jahrb. 49 (1912) 132.

Small tree. *Young branches* pubescent with dark brown, 1 mm. long, erect hairs at right angles to them, later glabrous and dark coloured. *Leaves* thin, lanceolate, acuminate, base rounded, glabrous above, pubescent below on the midrib and nerves with scattered adpressed, 1 mm. long hairs; main nerves 8–10 pairs not visible above but prominent beneath, interarching 3 mm. from margin; reticulations forming a loose network; length 7–12 cm.; breadth 1·8–2·5 cm.; petiole 1–2 mm. long, hairy. *Flowers* solitary, sub-sessile, opposite the leaves. *Sepals* ovate-lanceolate, acute, hairy outside, glabrous inside, 7 mm. long. *Petals* triangular-lanceolate, thinly hairy outside with dark brown, 1 mm. long hairs. *Stamens* 1 mm. long with broad, orbicular, flat-topped connectives. *Ovaries* 6 with a short but distinct hairy style; stigma broad, sub-orbicular. *Ripe carpels* sessile, ovoid, setose with 3 mm. long brown hairs, length 7 mm., diam. 5 mm.

PENANG: Pulau Boetong Reserve, *Curtis 2745* (S., Kew) type.
DISTRIBUTION: Only known from this record.

Very rare. The subsessile flowers recall *P. parviflora* but the leaves are longer and acuminate, not blunt. No flower colour is noted by Curtis or Ridley.

There are three sheets of a species, probably new, resembling *P. hirtifolia* in Herb. Sing.—*Curtis, December 1902* and *February 1910* and *Ridley, date 1899* all from Lumut, Dindings, Perak. The flowers are sessile and the leaves are broader.

(14) **P. bullata** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 313 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 79 Pl. 111; Ridley, F.M.P. 1 (1922) 55.

Shrub 2–3 m. high. *Young twigs* covered with golden, erect 2 mm. long hairs. *Leaves* papery or thinly coriaceous, bullate, medium green and shining above, paler beneath, drying silvery-grey, lanceolate or oblong-lanceolate, the sides nearly parallel, apex acute, base deeply cordate and auricled, nearly sessile, glabrous except the sunk midrib, sparsely hirsute below on the nerves and especially the midrib, the hairs similar to those on the young twigs; main nerves 25–40 pairs, sunk above, prominent beneath, the secondary also numerous and prominent, both sets leaving the midrib at nearly right angles, curving gradually and anastomosing in a bold and continuous line round the margin; reticulations

prominent and very lax; length 28–37 cm.; breadth very variable, 3–12 cm.; petiole 3–5 mm. long, stout. *Pedicels* solitary or 2–3 arising together, slender, erect, terminal, opposite the leaves, 2·5 cm. long. *Sepals* lanceolate, spreading, obtuse, sparsely pubescent outside, glabrous inside, 5–7 mm. long. *Petals* 2·5 cm. long, narrow-linear, sub-equal, sub-concave, sparsely pubescent. *Stamens* numerous, connectives slightly convex, orbicular. *Ovaries* few, oblong, pubescent, the stigma sub-capitate, truncate, puberulous. *Ripe carpels* sub-globose, puberulous, 1 cm. in diam.; stalks slender, 5 mm. long. *Seeds* 2, plano-convex, pale, rugose.

PERAK: Gopeng, Kinta, *King 4729* and *4804* (C., Kew) both type material.

PAHANG: Kemansul F.R., *Ja'amat 40870* (K.).

SELANGOR: Semenyih, *Hume F.M.S. Mus. Herb. 8151* (S.); Dusun Tua, *Ridley, May 1896* (S.).

NEGRI SEMBILAN: Gunong Angsi, *Nur S.F.N. 11673* (S.).

MALACCA: *Alvins, 1st October, 1885* (S.); stream by Kemendor factory, *Burkill S.F.N. 4465* (S.).

JOHORE: Sungei Sedili, Mersing Road, *Corner, 30th September, 1936* (S.); Ulu Tiram, *Corner, 18th September, 1932.*

SINGAPORE: *Cantley,* no data. Doubtful if from Singapore.

DISTRIBUTION: Siam.

There is quite a similarity between this *Polyalthia* and the Bornean *P. insignis* (Hk. f.) Airy-Shaw, especially in the leaves which are cordate and auricled at the base in both species but *P. insignis* is quite glabrous and has much larger flowers. Most collectors state that *P. bullata* is a shrub 2–3 m. high but Corner states on the label of the Ulu Tiram plant, a climber about 30 feet long, evidently a sarmentose shrub when young. The leaves of *P. bullata* vary considerably in width. The specimens from Semenyih, Selangor and Gunong Angsi, N. Sembilan have leaves 2–4 cm. wide. The Malacca and Johore specimens vary from 6–12 cm. wide. There is no information on the colour of the flower.

(15) **P. brunneifolia** J. Sinclair, **sp. nov.**

Haec species foliorum aspectu et colore (castaneo in sicco) *P. stenopetalam* revocat sed propter flores extra-axillares vel foliis oppositos apud *P. parviflorum, P. hirtifoliam* et *P. Motleyanam* ponenda. A duabus illis petalis longioribus, foliis longioribus et latioribus, ab hac floribus minoribus, foliis pauci-nervatis minoribus castaneis differt.

Frutex 2–4 m. altus. *Ramuli novelli* minute atro-fusco-tomentosi, deinde glabri. *Folia* 14–17 cm. longa, 3·5–6·5 cm. lata,

coriacea, oblongo-elliptica vel oblongo-lanceolata, nitida, utrinque glabra, in sicco atro-brunnea, apice acuta, basi rotunda et inaequilateralia; nervi 8–9 pares, supra obscuri et depressi, subtus prominentes, curvati, 3–4 mm. prope marginem anastomosantes; reticulationes obscurae et laxae; petioli 3–5 mm. longi, pubescentes. *Flores* 1–2 oppositi foliis vel paullo infra dispositi. *Pedicelli* 4–5 mm. longi, pubescentes, basi bracteolati. *Sepala* 5 mm. longa, triangularia, acuta, atro-brunnea, extus pubescentia, intus glabra. *Petala* subaequalia, 2–2·5 cm. longa, 6 mm. lata, alba vel albo-rosea, lanceolata, acuta, extus leviter pubescentia. *Stamina* numerosa, 2 mm. longa, connectivis convexis. *Ovaria* 2 mm. longa, pubescentia. *Carpella* fere 6, globosa, primum minute pubescentia, deinde glabra, rosea, 8 mm.–1·5 cm. longa; stipites 3–4 mm. longi. *Semina* 1–2.

PERAK: *King 7946* (C.); Larut, *King 5702* (C.).

PAHANG: Tahan River, *Mat, date 1893* (S.).

SELANGOR: Bukit Enggang, Kajang, *Symington 24179* (S., Kew) holotype; Sungei Lalang Reserve, Kajang, *Symington 22962* (S., Kew); Dusun Tua, *Ridley 7281* (S., C.); Sungei Buloh F.R., *Abu 3347* (K.).

NEGRI SEMBILAN: Gunong Angsi, *Nur S.F.N. 11759* (S., Kew).

JOHORE: 13½ mile Mawai-Jemaluang Road, *Corner, 13th May, 1935* (S.); S. Kayu Ara, Mawai-Jemaluang Road, *Corner, 10th February, 1935* (S.).

DISTRIBUTION: These are the only localities.

The leaves when dry are a rich nut-brown colour, hence the name *brunneifolia.*

(16) **P. chrysotricha** Ridley, F.M.P. 1 (1922) 57.

Tree 10 m. high. *Young twigs* densely rusty-tomentose; older reddish and rough or wrinkled. *Leaves* chartaceous, obovate-lanceolate to oblanceolate, gradually narrowed to the rounded and slightly cordate or emarginate base, nearly sessile, apex abruptly and bluntly acute, glabrous above, rusty-pubescent beneath on the midrib and on the nerves and numerous lax reticulations; nerves 13–15 pairs, faint and sunk above, prominent beneath, curving, ascending and interarching at the margin; length 19–34 cm.; breadth 4–11 cm.; petiole 3 mm. long, rusty-pubescent. *Flowers* 2–3 together, opposite the leaves or slightly below, subtended by a linear, acute 1·8–2 cm. long bract which is tomentose on the lower and glabrous on the upper surface. *Pedicels* 1·2 cm. long, stout and densely rusty-tomentose. *Sepals* 1·3 cm. long, ovate, acute, densely rusty-tomentose on the outside as are the petals, both glabrous inside. *Petals* ovate-triangular, acute with a broad base, 2·5 cm. long or more, 1·3 cm. broad at base; inner narrower.

Stamens numerous with orbicular convex connectives. *Ovaries* numerous, densely tomentose. *Ripe carpels* lanate with brown, 5–6 mm. long hairs, obovate, obtuse, shrinking on drying, 1·7 cm. long and 1·7 cm. in diam.; stalk 7 mm. long, thin. *Seeds* 2.

PAHANG: Sungei Yet, Bukit Fraser, *Nur S.F.N. 11127* (S., K., Kew); *Henderson F.M.S. Mus. Herb. 11421* (Kew); Tahan River, *Mat, 23rd September, 1893* (S.).

SELANGOR: Bukit Kutu, *Ridley, June 1890* (S.); Menuang Gasing, Ulu Langat, *Kloss* (Kew) type.

DISTRIBUTION: Probably Sumatra.

Comes near *P. Motleyana* var. *glabrescens* but the leaves of *P. chrysotricha* are much more hairy and the base is cordate. In *P. chrysotricha* also the bract of the inflorescence is much larger, 1·8–2 cm. long and the carpels lanose.

(17) **P. Motleyana** (Hk. f.) Airy-Shaw in Kew Bull. (1939) 280.

Basonym: Oxymitra Motleyana Hk. f. in Trans. Linn. Soc. 23 (1860) 155; Ridley in Sarawak Mus. Journ. 1 No. 3 (1913) 88.

Small tree 3–4 m. high. *Young twigs* rusty-brown-tomentose, becoming glabrescent. *Leaves* oblanceolate, to elliptic-oblanceolate, base rounded or broadly cuneate, apex rounded or very shortly cuspidate-acuminate, chartaceous, drying greyish above, brown beneath, slightly hairy above, the sunk midrib being tomentose, pilose beneath, especially on the raised midrib and veins with a tendency to become glabrous; main nerves 15–20 pairs, spreading, ascending and anastomosing near margin; reticulations faint above, prominent and lax beneath; length 10–30 cm.; breadth 3–10 cm.; petiole 3–7 mm. long, rusty-tomentose. *Flowers* extra-axillary, between the leaves or opposite them, sessile or on a densely tomentose pedicel up to 5 mm. long (rarely 1 cm. long). *Sepals* ovate-deltoid, 8–9 mm. long and almost as broad, acute, densely tomentose outside, glabrous inside. *Exterior petals* broadly lanceolate, about 1·5 cm. long and 7–8 mm. broad, obtuse or acute, the interior oblong-elliptic, about 1·5 cm. long and 5–6 mm. broad, somewhat obtuse, both sets densely sericeous, tomentose outside, glabrous inside. *Stamens* numerous, cuneiform, 2·5 mm. long, connectives flat-topped, rhomboid by compression. *Ovaries* hirsute. *Fruit* not seen.

KEDAH: Bukit Kuala Bintang, Gunong Bintang, *Haniff S.F.N. 21084* (S.).

DISTRIBUTION: Borneo and Riouw Archipelago.

This specimen agrees with Airy-Shaw's description and with *Richards 1408* from Dulit, Sarawak but the flowering pedicel is 8 mm. long. It is therefore somewhat intermediate between typical

P. motleyana and *P. motleyana* var. *glabrescens*. *Bunnemeyer 5908* from the Riouw Archipelago has sessile flowers, the younger leaves are sparingly pubescent while the older ones are glabrous. *Haviland,* Sarawak, *date 1891* is similar with densely sericeous, sessile flowers but the leaves are nearly glabrous. It seems therefore that the character of the sessile, densely sericeous flowers is a better one than the pubescence of the leaves which is variable.

P. oblonga King has two vars., one with a short pedicel and the other with a much longer pedicel. Airy-Shaw has called the one with the shorter pedicel *P. Motleyana* var. *glabrescens* Airy-Shaw [Kew Bull. (1939) 282]. I can not see that the form with the longer pedicels is a different species so I have made that a variety of *P. Motleyana* and have called it *P. Motleyana* var. *oblonga* (King) Sinclair.

Very closely allied too is *P. microtus* Miq. with glabrous petals and smaller leaves.

P. Motleyana var. **oblonga** (King) J. Sinclair, **stat. nov.**

Synonym: P. oblonga King pro parte, Mat. F.M.P. Vol. 1 No. 4 (1892) 314 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 80 Pl. 113; Ridley, F.M.P. 1 (1922) 57.

Differs from var. *glabrescens* in having the flowering pedicels 2–8 cm. long, average length 4–5 cm. and the leaves often minutely cordate at the base. King's plate 113 of *P. oblonga* is correct for *P. Motleyana* var. *oblonga* (King) Sinclair.

Since no description of the fruit of *P. Motleyana* is given by Airy-Shaw, the following description is appended and is meant for the var. *oblonga*. *Ripe carpels* 10–20, ovoid to orbicular, apiculate, about 1 cm. long, pubescent or subglabrous; stalks slender, 1·5–1·8 cm. long. *Seeds* 1–2, ovoid and plano-convex.

PERAK: Relau Tujor, *Wray 1808* (S., C.) and *2191* (S., C.); Maxwell's Hill, *Wray 2805* (S., C.); Harom, *Scortechini 660* (S., C.); Larut, *King Nos. 7671* (S., C., D.D., Kew); *6465* (C., Kew); *4099* (C., D.D., E., Kew); *3399* (C., D.D., E.); *5733* (C., Kew); *1944* (C.); *2261* (C., Kew); *5141* (C., Kew); *6358* (C.); Ulu Bubong *King 10198* (C.); Waterloo, *Curtis 2703* (S., C.); and *1281* (S., Kew); Temoh near Tapah, *Ridley, November 1908* (S.); Bujong Malacca, *Ridley, September 1898* (S.); Gunong Keledang, *Ridley 9678* (S.).

SELANGOR: Ulu Gombak, Hume *F.M.S. Mus. Nos. 8478; 8732; 8720* (S.).

P. Motleyana is a polymorphic species with several varieties. There are forms intermediate between these varieties and that is most likely due to its wide distribution.

P. Motleyana var. **glabrescens** Airy-Shaw in Kew Bull. (1939) 282.

Synonyms: P. oblonga King pro parte Mat. F.M.P. Vol. 1 No. 4 (1892) 314 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 80; Ridley, F.M.P. 1 (1922) 57. *Guatteria multinervis* Wall. Cat. 6445 (1832).

Leaves glabrous on both sides except the sometimes slightly pubescent midrib and lateral nerves which at length become glabrous, more narrowed at the base, less cordate and often smaller than in the var. *oblonga. Pedicels* 1 cm. long or under, average length 5–8 mm. The pubescence of the petals is variable as in the var. *oblonga.*

PROVINCE WELLESLEY: Bukit Mertajam, *Burkill S.F.N. 9017* (S.); Bukit Juru, *Curtis, June 1890* (S.).
PENANG: Penang Hill, *Holttum S.F.N. 37352* (S.); Pulau Boetong. *Curtis 1409* and Government Hill *1409* (S., Kew); Moniot Road, Penang Hill, *Sinclair S.F.N. 39345* (S.); Chendroh F.R., *Ja'amat 39207* (S., K.); Kledang Saiong F.R., *Ja'amat 23925* (K.) and *Symington 25622* (K.); Bubu F.R., *Arnot 30661* (K.); Hermitage, *Curtis 1277* (S., Kew).
SELANGOR: Sungei Lalang F.R., Kajang, *Symington 24216* (K.).
JOHORE: Gunong Janing, *Lake* and *Kelsall, 20th October, 1892* (S.).
DISTRIBUTION: Siam, Sarawak.

The type sheet in Herb. Kew in Lobb "Singapore" (Herbarium Hookerianum). Singapore is an error.

(18) **P. Jenkensii** (Hk. f. et Th.) Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 64; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 305 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 70 Pl. 96 pro parte quoad Maingay 46 and 45 in part.

Basonym: Guatteria Jenkensii Hk. f. et Th. Fl. Ind. 1 (1855) pro parte 141.

Synonyms: Polyalthia andamanica Kurz Andam. Report (1870) 29. *P. Havilandii* Boerl. in Icon. Bogor. 1 (1899) 107 T. 66. *P. Cumingiana* Merr. in Govt. Lab. Publ. (Philip.) 35 (1906) 71. *Unona agusanensis* Elm. Leafl. Philip. Bot. 5 (1913) 1743. *Polyalthia agusanensis* Merr. in Philip. Journ. Sc. Bot. 10 (1915) 250. *Polyalthia Rumphii* (Bl.) Merr. Enum. Philip. Fl. Plants 2 (1923) 162 sensu Merr. non sensu Bl.

Tree 10–20 m. high with slender drooping branches. Tips of young twigs minutely rusty-pubescent, soon glabrous, rather pale, striate. *Leaves* thinly coriaceous, oblong-lanceolate, apex acute, base acute or slightly rounded, often sub-oblique, glabrous, drying pale green, upper surface shining; main nerves 9–12 pairs, slightly

pubescent when young, soon glabrous, fine above, prominent beneath, curving deeply, anastomosing some distance from margin; reticulations faint above, forming a distinct and close network below; length 10–22 cm.; breadth 3·5–7·5 cm.; petiole 5–8 mm. long. *Pedicels* axillary, solitary, 1–2 cm. long, adpressed-rusty-tomentose with several minute rounded bracts near the base and occasionally a median one. *Sepals* very small, 3 mm. long, suborbicular, obtuse, pubescent outside, often reflexed. *Petals* subcoriaceous, spreading, greenish, changing to yellow, broadly lanceolate or elliptic, sub-acute or obtuse, broadest at the middle, the base much narrowed, puberulous or glabrous, 3·5–4 cm. long. *Stamens* numerous, 1 mm. long; connectives flat-topped or convex. *Ovaries* 1 mm. long, pubescent with a globose, faintly grooved stigma. *Ripe carpels* numerous, glabrous, oblong, slightly apiculate, 9 mm.–1·1 cm. long; stalks slender, 1·5 cm. long. *Seed* 1, smooth.

KEDAH: Langkawi, *Curtis, September 1890* (S.).

PENANG: Pulau Boetong Reserve, *Curtis 2775* (S., Kew).

PERAK: Waterloo, *Curtis 2717* (S., C., E.); Binbang Kijau Reserve, *Durant 12195* (K., Kew); Larut, *King 3910* (S., C., D.D., Kew).

PAHANG: Jahit Btg., *Ahmad 4069* (K., Kew).

MALACCA: *Maingay 46* (C., Kew) and *45* in part (Kew) type material of *G. Jenkensii; Griffith, sine num.* (C.) type material of *G. Jenkensii;* Machap, *Goodenough 1778* (S.); *Alvins 440* (S.).

SINGAPORE: Bukit Timah, *Ngadiman S.F.N. 34691* (S., K., D.D., Kew).

DISTRIBUTION: Assam, Indo-China, Malaya, Malay Islands, Philippines.

See notes under *P. Rumphii.*

(19) **P. Rumphii** (Bl.) Merr. Enum. Philip. Fl. Plants 2 (1923) 162 Tab. 5, quoad icones Rumphianas non. sensu Merr.

Basonym: Guatteria Rumphii Bl. in Henschel Vita Rumph. (1833) 153 (*Arbor nigra parvifolia* Rumph. Herb. Amb. 5: 10, T. 4, f. 2; T. 5).

Synonyms: Guatteria Jenkensii Hk. f. et Th. Fl. Ind. 1 (1855) 141 pro parte. *Polyalthia Jenkensii* Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 64 pro parte quoad Maingay 45. *Guatteria canangioides* Reichb. f. and Zoll. in Linnaea 29 (1857) 328. *G. parveana* Miq. Fl. Ind. Bat. Vol. 1 Pt. 1 (1858) 48. *Monoon canangioides* Miq. in Ann. Mus. Bot. Lugd.-Bat. 2 (1865) 18. *Polyalthia canangioides* (Miq.) Boerl. in Icon. Bogor. 1 (1899) 105. *P. Scortechinii* King, Mat. F.M.P. Vol. 1 No. 4 (1892) 305 et in Ann. Roy. Bot.

Gard. Calc. 4 (1893) 69 Pl. 95; Ridley, F.M.P. 1 (1922) 56. *P. Kunstleri* King, Mat. F.M.P. Vol. 1 No. 4 (1892) 304 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 69 Pl. 87B; Ridley, F.M.P. 1 (1922) 55. *P. glandulosa* Merr. in Philip. Journ. Sc. 10 (1915) 247.

Tree 5–15 m. high. *Young branches* minutely rusty-pubescent, soon glabrous. *Leaves* as in *P. Jenkensii,* rather variable but the main nerves more prominent on the lower surface and the reticulations not quite so close. *Pedicels* also similar but median bract rather larger, 5 mm. long, rusty-pubescent with recurved edges. *Sepals* triangular, acute, pubescent on both surfaces, 6 mm. –1·5 cm. long, average length 1 cm. *Petals* as in *P. Jenkensii.* rather variable in shape, edges often wavy, 3–5·5 cm. long. *Stamens, ovaries* and *carpels* more or less as in *P. Jenkensii.*

KEDAH: Jerai Reserve, *Mat 17947* (S., K.); Gunong Jerai, *Meh 10156* (S., K.); Babut, Katunbah, *Meh 8914* (K.); 19th mile B. Selambau, *Meh 8982* (K., Kew).

PERAK: *Scortechini 1500* (S., C.); 206B (S., C., Kew); Larut, *King 4270* (S., C., Kew); *6125* (C., D.D., Kew); *6845* (C., Kew); *3767* (C., D.D., Kew); Gopeng, Kinta, *King 4531* (C., D.D.); Ulu Bubong, *King 10010* (C.); *King* sine loc. exact. *10975* (C.); *10807* (C., Kew); Relau Tujor, *Wray, 3142* (S., C.).

TRENGGANU: Bukit Kajang, *Corner 30278* (S.) Probably. Immature flowers.

PAHANG: Temerloh, *Awang Lela C.F. Field No. 4522* (S., K.); Bilur F.R., *Syed Ali 23490* (K.); Putat F.R., *Baba 10774* (K.).

SELANGOR: Sungei Buloh, *Hamid 2418* (S., K.); *Ja'amat 15305* (S., K.); Sepang, *Denny, February 1948* (S.); Public Gardens, Kuala Lumpur, *Ahmad C.F. No. 4926* (S., K., Kew) and *C.F. No. 3883* (Kew).

NEGRI SEMBILAN: Sungei Menyala, Port Dickson, *Wyatt-Smith* and *Sow 64606* (K.); Gunong Angsi F.R., *Tachon 23743* (S., K.).

MALACCA: *Griffith 413* (C., Kew); Selandor, *Ridley 10764* (S.); Ayer Panas, *Goodenough 1981* (S., C., Kew); *Maingay 45* (Kew).

JOHORE: Mount Austin, *Ridley 11993* (S.); Sungei Pulai Dua, *Nur* and *Kiah, S.F.N. 7738* (S., Kew); Gunong Panti, *Ridley 4182* (S.).

SINGAPORE: Gardens' Jungle, *Ridley 3863* (Kew) and *6526* (Kew).

DISTRIBUTION: Borneo, Sumatra, Java, Amboina, Philippines.

The problem of nomenclature for species 18 and 19 is an extremely difficult and complex one. Both are closely related and have a wide area of distribution hence the numerous synonyms. The only satisfactory method of distinguishing one from the other seems to be by the sepals. There are two groups:—

(1) triangular, acute and long, 6 mm.–1·5 cm., the average length being 1 cm.

(2) more rotund or orbicular, obtuse, short, about 3 mm. long.

At Kew I examined the various types and grouped them under (1) and (2). It was then found that some of the synonyms were not under the same species as former authors had placed them.

I have used *P. Rumphii* as the name for the species with the long sepals since it was typified by Merrill on *Guatteria Rumphii* Bl. in Henschel. The figure T. 5 in Rumphius Herb. Amb., although not a good one clearly shows the long acute sepals. Unfortunately however the specimens distributed from the Philippines by Merrill under the name *P. Rumphii* (Bl.) Merr. have the short rotund sepals so they have to be excluded from *P. Rumphii* sensu Bl. and referred to *P. Jenkensii.*

For the species with the short sepals I have used the same *P. Jenkensii.* Unfortunately also the original type material (*Guatteria Jenkensii*) consisted of two parts (1) with long and (2) with short sepals. King has made this clear in Ann. Roy. Bot. Gard. Calc. 4 (1893) 70. The part with the long sepals is the type of *P. Jenkensii* and the other is placed in *P. Rumphii.*

In Ridley's Flora *P. Jenkensii* is to be found under species 22, *P. canangioides* Boerl. but the type of *P. canangioides* as typified on *Guatteria canangioides* has long sepals. *P. Rumphii* in Ridley's Flora would include species 17, *P. Kunstleri* and species 21, *P. Scortechinii.* The following species distributed as *P. Kunstleri,* I have reduced to *P. Rumphii.*

PERAK: *Scortechini 2001* (S., C.); *King 7937* (S.); *7984* (C., D.D., Kew); *7951* (C., Kew); *3767* (Kew).
MALACCA: Jasin Road 15th mile, *Burkill S.F.N. 2189* (S., Kew).

King says the leaves and fruit are exactly the same as *P. Scortechinii* but the flowers are different. He quotes as type material, King's collector, Scortechini and Wray. The flowers of the material examined by King were immature and therefore much smaller. There is no other difference.

(20) **P. pachyphylla** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 315 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 82 Pl. 115; Ridley, F.M.P. 1 (1922) 59.

Tree 15–30 m. high. *Twigs* rather coarsely striate. *Leaves* coriaceous, dark glossy-green above, pale beneath, glabrous, elliptic-oblong, apex acute, base acute; nerves 11–12 pairs, rather straight, prominent above, more prominent beneath, running out to edge and not or only slightly interarching; midrib sunk above, raised below; reticulations forming a close network on both surfaces; length 11·5–19 cm.; breadth 4·5–9 cm.; petiole stout, 7 mm.–1·2 cm. long. *Flowers* about 3·8 cm. long in fascicles from tubercles on the older branches; pedicels 5 cm. long, tomentose with a median, obtuse bract. *Sepals* nearly orbicular, reflexed,

tomentose, 2 mm. long. *Petals* coriaceous several-veined, pale green, oblong-lanceolate or oblanceolate, sub-acute or obtuse, pubescent on the outer, tomentose on the inner surface, the outer set slightly shorter and narrower than the inner, 2·4–3·7 cm. long and 7 mm.–1 cm. broad. *Stamens* numerous, compressed, apex of connectives truncate. *Ovaries* numerous, stigma sessile, truncate. *Ripe carpels* numerous, crowded and densely covered with pale tomentum; when mature narrowly obovoid, blunt, narrowed to a short thick stalk or nearly sessile, 4·5 cm. long and about 2·5 cm. in diam.; pericarp thick, fleshy. *Seeds* 1.

PERAK: Larut, *King 7516* (S., C., Kew); *King 6655* (C., D.D.) both type material.

DISTRIBUTION: Not known from elsewhere.

The most distinctive feature of this species is the very short stalked carpels. The here-mentioned are the only records and the material at my disposal is very scanty and fragmentary. I can only find one seed per carpel although King states two.

(21) **P. asteriella** Ridley in Journ. As. Soc. Str. Br. 82 (1920) 169; F.M.P. 1 (1922) 53.

Synonym: P. simiarum (Hk. f. et Th.) Hk. f. et Th. var. *parvifolia* King pro parte (mixtum compositum) Mat. F.M.P. Vol. 1 No. 4 (1892) 307 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 73; Ridley F.M.P. 1 (1922) 61.

Tree 10–12 m. high. *Branchlets* minutely puberulous becoming glabrous, finely striate. *Leaves* thinly coriaceous, lanceolate, acuminate with acute base, shining above, duller but of a pale straw colour beneath, glabrous except for the petiole and the basal portion of the midrib below which is sometimes minutely and sparsely puberulous; nerves 11–15 pairs, slightly raised above, prominent beneath, rather straight, ascending steeply; reticulations forming a fine network, not prominent; length 12–20 cm.; breadth 3·5–6 cm.; petiole 5–8 mm. long. *Flowers* in fascicles of 2 or 3 on short, pubescent, 3 mm. long peduncles in the axils of the leaves or mostly of fallen leaves; pedicels 3–4 cm. long, slender, adpressed-pubescent with a minute, oblong, pubescent bract at base. *Sepals* broadly ovate, acute, pubescent, 1 mm. long. *Petals* spreading, pale green, fleshy, linear, strap-shaped, acute, slightly expanded at base, sparsely adpressed-pubescent on both surfaces, 2–2·3 cm. long and 2 mm. broad, inner slightly smaller. *Stamens* numerous, 1 mm. long with flat-topped connectives. *Ovaries* about

1 mm. long, pubescent. *Torus* pubescent. *Carpels* 6–12, oblong, obtuse at apex, glabrous, black when dry, 2 cm. long and 8 mm.–1 cm. broad (may be slightly immature); stalks 2·5 cm. long.

KEDAH: Gunong Lang, *Kiah S.F.N. 35043* (S., K., Kew).

PERAK: *Scortechini 592b* (S., C.); Maxwell's Hill, Ridley *2986* (S., C., Kew) type material.

DISTRIBUTION: Siam.

This is very close to *P. simiarum* but the leaves have a more glossy appearance above and they do not dry that pale yellow-green colour associated with *P. simiarum*. Also they are much narrower and not rounded at the base nor broad across the middle as in *P. simiarum*. The petals too are much narrower. *P. simiarum* is common in India and Burma but has not been found in Malaya so it is better to follow Ridley and keep *P. asteriella* separate. There are several species very close to *P. simiarum* differing only slightly from it. These are *P. viridis, P. jucunda* and *P. Thorelii*.

King's *P. simiarum* var. *parvifolia* is a mixtum compositum. Some of the sheets named so by him are *P. asteriella* but his *3850* from Larut, Perak, is *P. Hookerianum* and he has other species included (Ridley F.M.P. 61).

(22) **P. lateriflora** (Bl.) King, Mat. F.M.P. Vol. 1 No. 4 (1892) 307 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 73 Pl. 102; Boerl. in Icon. Bog. 1 (1899) 105; Ridley, F.M.P. 1 (1922) 59.

Basonym: Guatteria lateriflora Bl. Bijdr. (1825) 20 et Fl. Jav. Anon. (1830) 100 T. 50 and 52D; Miq. Fl. Ind. Bat. 1 Pt. 1 (1858) 47.

Synonym: Monoon lateriflorum Miq. Ann. Mus. Bot. Ludg.-Bat. 2 (1865) 19.

Monopodial tree 6–20 m. high. *Bark* greyish-brown, finely cracked, with horizontal ridges. *Twigs* coarsely striate. *Young leaves* a beautiful scarlet; mature coriaceous, dark green, shining above, medium green beneath, glabrous, oblong to elliptic-oblong, acute or shortly acuminate, slightly narrowed to the rounded or sub-cordate base; nerves 12–20 pairs, prominent, oblique and nearly straight, running out to margin; midrib sunk above, bold beneath with two lateral furrows, reticulations close but often not quite so distinct as in *P. sclerophylla;* length 20–40 cm.; breadth 6·5–13 cm.; petiole 7 mm.–1·5 cm. long, stout, glabrous. *Flowers* in fascicles from tubercles on the stem and larger branches; pedicels 6·5–10 cm. long, pubescent, sometimes flattened upwards with one obtuse, amplexical, sub-median bract. *Sepals* coriaceous, ovate-orbicular, slightly obtuse, minutely tomentose outside, 4–5 mm.

long. *Petals* coriaceous, greenish-yellow with various tinges of red especially at the base, oblong-lanceolate, gradually tapering to the sub-acute apex, several-veined, minutely pubescent especially on the outer surface, 3·5–4·3 cm. long and 7 mm.–1 cm. broad, the inner slightly smaller. *Stamens* 1·5 mm. long, flat-topped or convex. *Ovaries* 1·5 mm. long, pubescent. *Ripe carpels* red, crowded and numerous, ovoid-elliptic, blunt, glabrous, 3–3·5 cm. long and about 1·7 cm. broad, pericarp thin, fleshy; stalks stout, 3–5 cm. long. *Seed* as in *P. sclerophylla* with circumferential groove.

PERAK: Gunong Pondok, *Henderson, 7th June, 1930* (S.); Sungei Larut, *Wray 2419* (S.); *King 7694* (D.D., Kew); Ulu Bubong, *King 10447* (E., Kew); *6530* (Kew); Pulau Jarak, *Wyatt-Smith, Kepong Field Number 71080* (S., K.).

PAHANG: Kemansul F.R., Temerloh, *Hamid C.F. Field No. 4794* (S., K.).

SELANGOR: Bukit Cheraka F.R., *Walton 28388* (S., K.).

NEGRI SEMBILAN: Triang Reserve, Jelebu, *Yassim 4492* (S., K.).

MALACCA: *Alvins 521* probably (S.); *Maingay 96* (Kew).

JOHORE: Sungei Kayu, *Kiah S.F.N. 32169* (S.) and *S.F.N. 32033* (S., K., Kew); Sungei Sedili, *Corner 28th August, 1932* (S.); Gunong Lambak, *Sinclair S.F.N. 38944* (S., E.).

SINGAPORE: Mandai Road, *Corner S.F.N. 33141* (S., Kew); *Kiah 12th August, 1940* (S.).

DISTRIBUTION: Siam, Java and Sumatra.

Very close to *P. sclerophylla* in the flowers and fruit but with thicker pedicels. The best distinguishing feature is the much larger leaf—30 cm. long or over while the average length for *P. sclerophylla* is 15–20 cm. In *P. lateriflora* the leaves are also broader and the base is rounded or sub-cordate and rarely acute. The reticulations too are usually less marked.

(23) **P. sclerophylla** Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 65; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 308 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 74 Pl. 103; Ridley, F.M.P. 1 (1922) 58.

Synonyms; P. purpurea Ridley in Journ. As. Soc. Str. Br. 82 (1920) 168. *P. lateriflora* var. *Kallak* Boerl. in Cat. Hort. Bog. (1899) 19 et in Icon. Bog. 1 (1899) 105.

Tree 5–16 m. high. *Bark* greyish-black. *Twigs* glabrous except the youngest parts, rather coarsely striate. *Leaves* scarlet when very young; *mature* coriaceous, oblong-lanceolate or lanceolate with acute or rounded base, apex acute, shining on both surfaces, turning a medium brown when dry; nerves 10–12 pairs, spreading slightly, distinct on both surfaces; midrib distinct, raised below with 1–2 shallow grooves at base on lower surface; reticulations

very distinct and close on both surfaces giving the leaf a characteristic appearance; length 15–20 cm.; breadth 4–6·5 cm.; petiole 5 mm.–1·2 cm. long, stout, black when dry. *Flowers* in fascicles from small tubercles on the branches, 5 cm. in diam., odourless; pedicels 2·5–3·7 cm. long, stout, pubescent, becoming glabrous, with a sub-median, orbicular, 2 mm. long bract. *Sepals* ovate, obtuse, minutely pubescent outside, glabrous inside, 3 mm. long. *Petals* linear-oblong, acute or slightly obtuse, the base slightly concave, slightly puberulous on both surfaces, greenish-yellow when young, later brownish-red with a darker brown blurr at the base inside, 4–4·5 cm. long and 5–8 mm. broad, the inner slightly smaller. *Stamens* 1·5 mm. long with flat-topped or convex connectives. *Ovaries* 3·5 mm. long, pilose; style cylindric; stigma small, obtuse, pubescent, pinkish-white. *Carpels* at first red and then black when quite ripe, succulent, numerous, elliptic-oblong, apex obtuse, 2·5–3·7 cm. long, glabrous; stalks 2·5–3·7 cm. long. *Seed* oblong with a longitudinal groove running completely round it. **Fig. 20.**

PERAK: Lumut, Dindings, *Ridley 3105* (S.); Lubok Merbau, Kuala Kangsar, *Haniff S.F.N. 14923* (S., Kew); Bubu F. Reserve, *Symington 29940* (K.); Pulau Tioman, *Henderson S.F.N. 21717* (S., K., Kew).

PAHANG: Kuantan, *Soh 15114* (S., K., Kew); Pulau Duchong, *Corner S.F.N. 29858* (S., K., Kew).

NEGRI SEMBILAN: Sungei Menyala, Port Dickson, *Wyatt-Smith 64725* (K.).

MALACCA: *Maingay 101* (S., C., Kew) type of *P. sclerophylla.*

JOHORE: Bagan Limau, Sungei Sedili, *Corner S.F.N. 23894* (S.); Mawai, *Corner S.F.N. 25862* (S., K., C., Kew); Seduak, *Ridley 13505* (S.); Sungei Sedili, *Corner S.F.N. 32799* (S.).

SINGAPORE: Mandai Road, *Kiah, 20th August, 1940* (S.); cultivated in Bot. Gard. Singapore, *Ridley 12014* (S., K.) type material of *P. purpurea.*

DISTRIBUTION: Sumatra, *Krukoff 4101.* This has narrower leaves than *Maingay 101* but otherwise is similar.

This species is very closely allied to *P. lateriflora.* Boerlage makes several varieties of *P. lateriflora* but I have kept *P. sclerophylla* separate until more information is available. For differences see under *P. lateriflora.*

(24) **P. Hookeriana** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 306 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 71 Pl. 97; Ridley, F.M.P. 1 (1922) 58.

Tree 10–25 m. high. *Young twigs* tawny-pubescent, later glabrous, rather coarsely striate. *Leaves* membranous, shining, obovate-elliptic or oblanceolate, apex acute, base narrow and subcuneate or sometimes rounded, glabrous except for the midrib

above and below; nerves 10–12 pairs, visible above, prominent beneath, nearly straight and running out to the edge; reticulations rather fine and lax; length 10–20 cm.; breadth 4–7·5 cm.; petiole 5–7 mm. long, tomentose. *Pedicels* pubescent, about 2·5 cm. long

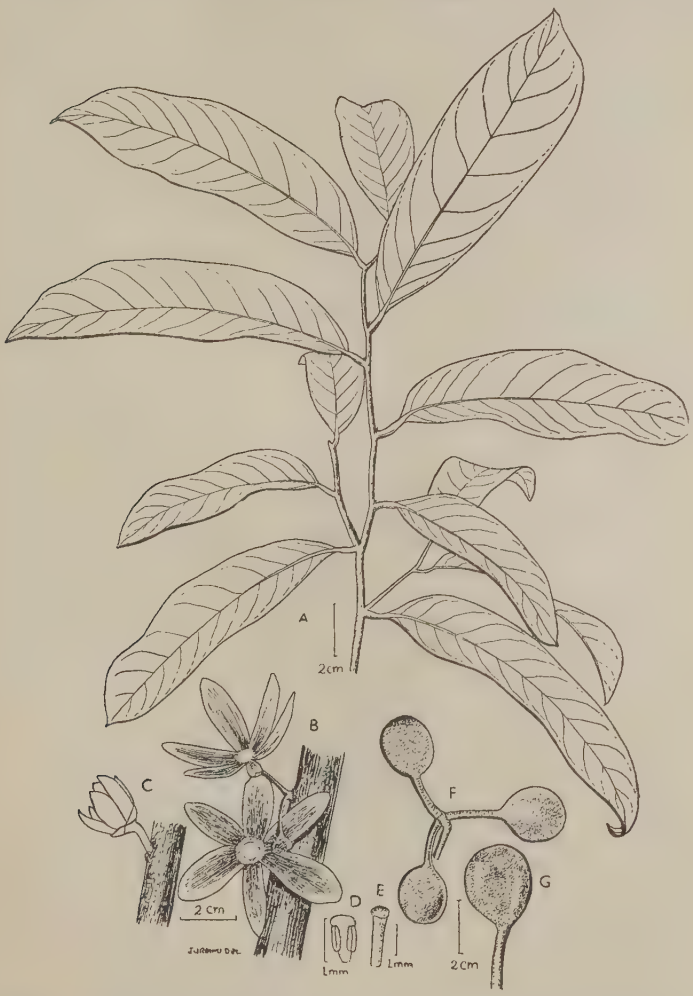


Fig. 20. *Polyalthia sclerophylla* Hk. f. et Th.
A, Leafy twig. B, Flower. C, Flower bud. D, Stamen, front view. E, Gynoecium. F and G, Fruit.

with an amplexicaul bract near base. *Sepals* ovate, acute, tomentose outside, glabrous inside, 3–4 mm. long. *Petals* pale yellow, sub-equal, obovate-oblong, obtuse, puberulous except at the base inside, slightly narrowed above base, 2·7–3 cm. long and 1·2 cm. wide at broadest part. *Stamens* 1–1·5 mm. long, numerous, with an orbicular top. *Ovaries* oblong, puberulous; stigma obovate with sub-truncate apex. *Ripe carpels* red, ovoid-oblong, glabrous, obtuse, 2–2·5 cm. long with stalks 3·5–4 cm. long. *Seed* one with longitudinal circumferential groove. **Fig. 21.**

Lower Siam: Kopah, Janjau Hill, *Haniff* and *Nur S.F.N. 2089* (S., Kew).

Kedah: Batas Tinggi, Gunong Bintang, *Haniff S.F.N. 21004* (S.); Koh Mai Forest Reserve, *Kiah S.F.N. 35220* (S.); Ulu Sungei Merah, *Sow 46049* (K.).

Perak: Larut, *King Nos. 5550* (C., Kew); *7501* (C., D.D., Kew); *5495* (C.); *3850* (C., D.D., Kew); *7814* (C., Kew); *6547* (C., E., Kew) King's numbers type material; *Wray 3944* S., C.) type material; Hermitage Hill, *Ridley, March 1892* (S.).

Fig. 21. *Polyalthia Hookeriana* King.

TRENGGANU: Ulu Brang, *Moysey* and *Kiah S.F.N. 33751* (S.).
PAHANG: Bukit Goh Reserve, Kuantan, *Mahamud C.F. 2800* (K., Kew).
JOHORE: Sungei Sedili, *Ngadiman S.F.N. 36859* (S., K., Kew); Mawai-Jemaluang Road, *Corner, 7th June, 1937* (S.).
SINGAPORE: Fern Valley, Bukit Timah, *Sinclair S.F.N. 39149* (S.).
DISTRIBUTION: Not known elsewhere.

Recalls *Phaeanthus crassipetalus* but the under surface of the leaf is not black on drying and the fruit is not beaked.

(25) **P. glabra** (Hk. f. et Th.) J. Sinclair, **comb. nov.**

Basonym: Ellipeia glabra Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 52; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 275 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 34 Pl. 27B.

Synonym: Polyalthia Curtisii Ridley in Journ. Roy. As. Soc. Str. Br. 54 (1910) 11 et F.M.P. 1 (1922) 59.

Tree 10–13 m. high. *Young twigs* yellowish-pubescent, later glabrous and striate. *Leaves* coriaceous, glabrous, elliptic-oblong, acute at apex with acute or slightly rounded base; nerves 8–9 pairs, prominent on both surfaces, curving and running out to margin; reticulations distinct on both surfaces and forming a close network; length 8–18 cm.; breadth 3·5–5 cm.; petiole 5–7 mm. long, pubescent. *Flowers* 3–5 together in a cyme on the twigs, pedicels slender, yellow-pubescent, 2–2·5 cm. long with a median, amplexicaul, acute bract. *Sepals* triangular, acute, yellow-pubescent outside, glabrous inside, 5–6 mm. long. *Petals* obovate-lanceolate, puberulous, slightly obtuse, narrowed above the base, 3–3·5 cm. long, the inner slightly smaller. *Stamens* 1 mm. long with flat-topped connectives. *Ovary* strigose. *Ripe carpels* sub-globose, 1·5–1·7 cm. long with slender stalks 1·8–3·2 cm. long; pericarp thin. *Seed* one, oblong, pale with a longitudinal circumferential groove.

PENANG: Telok Bahang, *Curtis 3664* (S., Kew) type material.
MALACCA: *Maingay 66* (C., Kew) type material.
DISTRIBUTION: These are the only records and it has not been collected again.

This is certainly not an *Ellipeia*. It resembles *Polyalthia Jenkensii* and *P. sclerophylla* in the reticulations. The fruit is smaller than in *P. sclerophylla* and the carpel stalks more slender.

(26) **P. hypogaea** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 311 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 77 Pl. 108; Ridley, F.M.P. 1 (1922) 61.

Tree 3–30 m. high. *Young twigs* softly tawny-tomentose, later glabrous, striate. Leaves thinly coriaceous, dark green and shining above, pale green beneath, glabrous, oblong or oblong-obovate,

apex rounded and then acute, base narrowed and rounded; nerves 18–23 pairs, slightly sunk above, raised beneath, nearly straight and parallel, interarching at the very edge but the lines often broken or faint; midrib sunk above, very prominent beneath and faintly warted, reticulations distinct on both surfaces; length 20–36 cm.; breadth 7·5–14 cm.; petiole 5–7 mm. long, stout, tomentose. *Flowering branches* at the base of the trunk, free or entering the soil and emerging, bearing the flowers, 30 cm.–2·5 m. long, rufous-pubescent. *Pedicels* 2–4 cm. long, rusty-pubescent, usually with a lanceolate, tomentose bracteole near the middle and a second sub-orbicular, acuminate one close to the flower—both about 3 mm. long. *Sepals* broadly ovate, acute, brownish-tomentose outside, glabrous inside, 5–7 mm. long. *Petals* pale yellow, 2·5–3 cm. long, coriaceous, narrowed from above the base upwards, acute, pubescent outside, glabrous inside or slightly pubescent. *Stamens* 3 mm. long with slightly convex tops. *Ovaries* oblong, pubescent; stigma large, ovoid, sessile. *Ripe carpels* elongated, elliptic-cylindric, densely and shortly chocolate-tomentose, total length 4·5–5·5 cm., including the 5 mm. long beak; breadth 1·5–2·3 cm.; stalks about 1·5 cm. long. *Seed* one with a longitudinal, circumferential furrow, filling the carpel.

KEDAH: Sama Gajah, Gunong Bintang, *Haniff S.F.N. 21010* (S.).

PERAK: Briah, Larut, *Wray 4206* (S., C.); *Wray 994* (S., C., Kew); Larut, *King 2437* (C., Kew) type material; Gunong Lanoh near Batu Gajah, *Mills* and *Henderson S.F.N. 15075* (S.); Hermitage Hill, *Ridley, March 1892* (S.).

TRENGGANU: Ulu Kajang, *Corner, 16th November, 1935* (S.).

PAHANG: Fraser's Hill, *Henderson F.M.S. 11373* (S.).

SELANGOR: Semenyih, Selangor, *Hume F.M.S. 8391* (S.).

NEGRI SEMBILAN: Galok Reserve, Seremban, *Symington 32696* (K.); Bukit Tangga, *Ridley, December 1920* (Kew).

JOHORE: Gunong Beridong, *Holttum S.F.N. 10977* (S.).

DISTRIBUTION: Not known outside Malaya.

This species is remarkable for its hypogeal flowering shoots. Air breathing roots are also present.

(27) **P. macropoda** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 309 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 74 Pl. 104; Ridley, F.M.P. 1 (1922) 60.

Tree 5–15 m. high. *Twigs* pale, glabrous, striate and angled. *Leaves* thinly coriaceous, shining, glabrous, acuminate, lanceolate, winged just above the petiole; nerves 9–10 pairs, fine but raised

on both surfaces, oblique and ascending steeply, line of inter-arching faint, broken or absent in parts; midrib with 2 fine furrows on lower surface; reticulations faint; length 13–23 cm.; breadth 3–5 cm.; petiole 5 mm.–1 cm. long, glabrous. *Flowers* cauliflorous on short, leafless, woody, cymosely branched twigs which measure up to 8 cm. long. *Pedicels* rough or slightly warted, 2–2·5 cm. long with a number of pubescent bracts at base and one obtuse, pubescent, amplexicaul bract above the middle. *Sepals* 1–1·3 cm. long, triangular, acute, connate at base, outer surface slightly rough, glabrous except for a few short hairs along the margin. *Petals* green, later yellowish, then white and finally darkening, mature ones 5·5 cm. long, pubescent on the margins and apex, outer oblong or oblong-elliptic, blunt, 2 cm. broad across the broadest part, spreading and slightly narrowed above the base, the narrowed part being concave on the outer surface and bent knee-fashion; the inner slightly narrower, spreading, similarly concave and bent at the narrowed part. *Stamens* 2 mm. long with flat-topped connectives. *Ovaries* 2 mm. long, numerous, glabrous, 4-angled; stigma sessile, pubescent, 4-angled. *Ripe carpels* oblong-ovoid, tapering to the apex, 4–6 cm. long, gradually narrowed into the 5 mm. long stalk; pericarp fleshy, orange, smooth when fresh but much wrinkled in the process of drying. *Seed* 1 with the characteristic circumferential groove.

PENANG: Richmond Valley, Government Hill, *Haniff S.F.N. 15550* (S., Kew).

PERAK: Sungei Siput, *Haniff* and *Nur S.F.N. 6957* (S., Kew); Ulu Kal, *King 10756* (D.D., Kew) and Gopeng, *King 4279* (Kew) both type material.

PAHANG: Cheroh, Raub, *Strugnell 20483* (K.).

SELANGOR: 16th mile Ulu Gombak, *Strugnell 12697* (S., K.); Ulu Gombak Reserve, *Talib C.F. 3036* (S.); Bukit Cheraka Reserve, *Strugnell 13021* (S., K.); Weld Hill Reserve, *Ahmad 9924* (S., K.); *Cubitt's collector C.F. 800* (S.); *Ahmad 12131* (K.); *Symington 45816* (K.); *Baba C.F. 1782* (K.); Semenyih, *Hume 8178* (S.); Ginting Simpah, *Hume 8904* (S.).

JOHORE: Gunong Pulai, *Nur* and *Kiah S.F.N. 7766* (S.); G. Panti, *Corner S.F.N. 26168* (S., K., Kew); Sungei Kayu, *Kiah S.F.N. 32067* (S., Kew).

SINGAPORE: Seletar, *Ridley 429* (S., Kew) type material; South side of MacRitchie Reservoir, *Sinclair S.F.N. 38860* (S., E.); Reservoir Jungle, *Corner 19th March, 1940* (S.); Bukit Timah, *Henderson S.F.N. 35906* (S., Kew).

DISTRIBUTION: Malaya.

This is quite separate from *P. clavigera* King. See notes under that species.

(28) **P. clavigera** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 309 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 75 Pl. 105.

Synonym: P. glomerata King, Mat. F.M.P. Vol. 1 No. 4 (1892) 310 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 75 Pl. 106; Ridley, F.M.P. 1 (1922) 59.

Tree 10–15 m. high. *Young twigs* very slightly pubescent, soon pale as in *P. macropoda. Leaves* thinly coriaceous, elliptic-lanceolate or oblong, acute or shortly acuminate, base acute or rounded, shining above, glabrous except for the pubescent midrib on upper surface; nerves 8–11 pairs, similar to those of *P. macropoda;* reticulations fine but visible on both surfaces; length 10–18 cm.; breadth 4·5–6·5 cm.; petiole 5–9 mm. long, slightly pubescent. *Flowers* cauliflorous, numerous on short 5–7 mm. long tubercles. *Pedicels* slender, 3·5–5 cm. long, puberulous with an ovate-lanceolate, pubescent bract about the middle. *Sepals* 3–4 cm. long, ovate, acute, connate at base, puberulous. *Petals* at first green, then yellow, coriaceous, linear-oblong, sub-erect, slightly narrowed above base, pubescent except at the base inside, 2–2·5 cm. long and 6–7 mm. broad at broadest part; the inner slightly smaller. *Stamens* numerous, 2 mm. long with truncate connectives. *Ovaries* 2 mm. long, pubescent with sessile, oblong, pubescent stigma. *Ripe carpels* yellow, ovoid-oblong, tapering at each end, glabrous, smooth when fresh but much wrinkled in the process of drying, 5–6 cm. long; stalks 2–3·5 cm. long. *Seed* 1 with groove as in *P. macropoda.*

PENANG: Road from Government Hill to Penara Bukit, *Curtis 2444* (S., C.) type material, fruiting only.

PERAK: Waterfall Hill, *Wray 2075* (S., C., Kew) type material, fruiting only; Maxwell's Hill, *Wray 505* (S., C.) flowering material; Sungei Kulim, *Burkill* and *Haniff S.F.N. 13806* (S.); Larut, *King 3817* (Kew) type material of *P. glomerata,* flowering.

PAHANG: Jahit Forest Reserve, Raub, *Pendah 0799* (S.).

SELANGOR: Bangi F.R., Kajang, *Kiai 8375* (K.).

NEGRI SEMBILAN: Kuala Pilah, *Holttum S.F.N. 9810* (S., Kew); Perhentian Tinggi, *Ridley 10038* (S., Kew).

SINGAPORE: Bukit Timah Fern Valley, *Ridley 5851* (S.); Stagmount, *Ridley, date 1907* (S.).

DISTRIBUTION: Lower Siam, Malaya. Probably Borneo and Sumatra.

P. clavigera King was described from fruiting material while *P. glomerata* King was from flowering material. They were both published simultaneously in Mat. F.M.P. They are one and the same species but King failed to connect them. I have chosen the name *P. clavigera* as the one to be used and *P. glomerata* to be a synonym of it. Ridley unfortunately further confused *P. clavigera*

with *P. macropoda* F.M.P. 1 (1922) 60 and made it a synonym of *P. macropoda* but recognized the flowering specimens as *P. glomerata.*

Although *P. clavigera* and *P. macropoda* resemble each other especially when sterile yet they can be distinguished quite readily. *P. clavigera* is separated from *P. macropoda* by:—

(1) The long stalked carpels and smaller torus.

(2) Flowers smaller and borne on short, woody swellings, not on longer, woody twigs 5 cm. long or more; the pedicels more slender and the petals more pubescent.

(3) The leaves are more rounded at the base, broader at the middle and are usually pubescent at the base of the midrib on the upper surface.

(29) **P. sumatrana** (Miq.) Kurz in Journ. As. Soc. Beng. 43/2 (1874) 53 pro parte basonymica tantum; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 302 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 66 Pl. 89; Merrill in Journ. St. Br. Roy. As. Soc. (1921) 258; Ridley, F.M.P. 1 (1922) 52 Fig. 6; Airy-Shaw in Kew Bull. (1939) 280.

Basonym: Guatteria sumatrana Miq. Fl. Ind. Bat. Suppl. (1861) 380.

Synonym: Monoon sumatranum Miq. in Ann. Mus. Bot. Lugd.-Bat. 2 (1865) 19.

Tree 10–20 m. high with light grey bark. *Twigs* glabrous, pale, sometimes with a brownish tinge, striate. *Leaves* coriaceous, glabrous, dark green and shining above, glaucous beneath, oblong-lanceolate, acute or acuminate, base acute; main nerves very fine, numerous, not distinct from the secondary, close together, rather crooked; midrib in dried specimens slightly reddish on lower surface; reticulations very fine on both surfaces; length 12–20 cm.; breadth 3–6·5 cm.; petiole 5–7 mm. long, stout, glabrous. *Flowers* 1–3 in axils of fallen leaves on the younger branches. *Pedicels* 1 cm. long, slightly furrowed, glabrous with a minute bract near base. *Sepals* very small, 2 mm. long, slightly orbicular, obtuse, minutely pubescent outside. *Petals* greenish, linear, star-shaped, spreading, sub-acute or slightly obtuse, minutely pubescent on both surfaces, 3·5–4 cm. long and 3–4 mm. broad, the inner slightly smaller. *Stamens* 1–1·5 mm. long, connectives flat-topped or convex, filaments minute. *Ovaries* 2 mm. long, slightly puberulous, angled with a groove running down from the pubescent stigma. *Ripe carpels* few, red, glabrous, ovoid, tapering to

each end, slightly ridged when dry, 3 cm. long and 1·7 cm. in diam.; stalks 1–1·5 cm. long; wall 3 mm. thick. *Seed* single, slightly pitted and with longitudinal ridge.

DISTRIBUTION: Numerous records from Perak, Pahang and Selangor. It has been collected in Trengganu, Negri Sembilan, Johore and Singapore. There are no specimens from the remaining northern states and Malacca but it is likely to be found in some of them. Its range extends to Borneo and Sumatra, but not Burma and the Andamans as stated by Kurz. His plant was probably *P. Parkinsonii.*

P. sumatrana is distinguished from *P. hypoleuca* and *P. glauca* by its larger flowers and by the ovoid carpels tapering to each end and slightly ridged when dry.

(30) **P. hypoleuca** Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 63; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 301 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 66 Pl. 88; Merrill in Journ. Str. Br. Roy. As. Soc. (1921) 257; Ridley, F.M.P. 1 (1922) 53.

Tree 8–15 m. high. *Twigs* pale, glabrous and striate. *Leaves* as in *P. sumatrana* but on the average smaller, more elegant, the veins closer together and the petioles more slender. *Flowers* 1 cm. long, axillary or from the axils of fallen leaves. *Pedicels* stout, furrowed, pubescent, 3–5 mm. long with 2 cucullate, pubescent bracts near base. *Sepals* very small, 1 mm. long, pubescent, deciduous. *Petals* light yellow, coriaceous, pubescent, linear-oblong, edges of outer slightly reflexed, 8 mm.–1·2 cm. long. *Stamens* 1 mm. long with flat-topped connectives. *Ovaries* about 6, angled, pubescent, 1·3 mm. long with a groove on the inner side, running down from the pubescent, sessile stigma. *Ripe carpels* 2–3, often solitary, elliptic-oblong, obtuse, not pointed at apex, glabrous, black when ripe, 1·5 cm. long by 1 cm. in diam.; stalks 5 mm. long. *Seed* one, transversely pitted and with a longitudinal circumferential ridge.

PENANG: Batu Ferengy, *Curtis 3597* (S., Kew).

PERAK: *Scortechini 152* (Kew); Gopeng, Kinta, *King 4702* (S., C., Kew); *King 6183* (E., Kew); Larut, *King 5310* (S., C., Kew).

PAHANG: Bukit Kajang F.R., Raub, *Jinal 20351* (S., K.); Bibut F.R., Raub, *Syed Ali 23492* (K.); Putat F.R., *Baba Nos. 10755* and *10793* (K.).

SELANGOR: Telok F.R., Klang, *Nur S.F.N. 34023* (S., K., Kew); Telok, 8th mile Klang, *Hamid* and *Yeob C.F. 3267* (S., K., Kew); *Symington 45808* (K.); Telok Bahru F.R., *Hamid 28833* (K.); Bukit Changgang, Klang, *Nur S.F.N. 33955* (S., K., Kew); Olar Limpit, Klang, *Lela* and *Jantan 4169* (K.); *Symington 43676* (K.); Kim Chin Hoe s.h. Klang, *Sudin 41882* (K.).

NEGRI SEMBILAN: Sungei Menyala F.R., *Wyatt-Smith 64739* and *64695* (K.).

MALACCA: Merlimau Reserve, *Forest Guard 25201* (K.); *Maingay 50* (Kew) type.

JOHORE: Sungei Kayu, *Kiah S.F.N. 32189* (S., K., Kew); Pengkalan Raja, Pontian, *Ngadiman Nos. S.F.N. 36644* (S., K., Kew); *36690* (S., K.); *36697* (S., K., Kew).

SINGAPORE: Sungei Jurong, *Corner S.F.N. 26163* (S., K., C., Kew).

DISTRIBUTION: Borneo and Sumatra.

When not in flower or fruit this species may be confused with *P. sumatrana* and *P. glauca*. It has smaller leaves with closer veins and the petioles are more slender. See notes under these species. There are three sheets of the type material, *Maingay 50,* in Herb. Kew, but unfortunately portions of *P. sumatrana* have been mounted on these sheets as well as *P. hypoleuca.*

(31) **P. glauca** (Hassk.) Boerl. in Cat. Hort. Bog. Feb. (1899) 18 et in Icon. Bog. 1 September (1899) 104.

Basonym: Uvaria glauca Hassk. in Beibl. Flora oder allgem. botan. Zeitung 2, No. 1 (1842) 31 et in Hoev. et de Vriese Tijdskr. Vol. 10? (1843) ? et in Diag. Nov. 127 (1843?) et in Cat. Hort. Bog. (1844) 175 et in Walp. Rptr. 5 (1845) 14.

Synonyms: Guatteria glauca Miq. Fl. Ind. Bat. Vol. 1 Part 1 (1858) 49; *Monoon glaucum* Miq. Ann. Mus. Bot. Lugd.-Bat. 2 (1865) 15; *Unona Merrittii* Merr. in Phil. J. Sc. 1 (1906) Suppl. 190; *Polyalthia Merrittii* Merr. in Phil. J. Sc. 10 (1915) Bot. 250 et in Enum. Phil. Fl. Plants 2 (1923) 160.

Tree 13–25 m. high with smooth, light grey bark. *Twigs* glabrous, pale, coarsely striate. *Leaves* as in *P. sumatrana* but usually more coriaceous, very often not distinguishable from them. *Flowers* fragrant, in fascicles of 3–10 on tubercles from the axils of fallen leaves; pedicels slender, glabrous 1·5–3 cm. long. *Sepals* pubescent outside, glabrous inside, the lobes orbicular, 1–2 mm. long. *Petals* linear-oblong, slightly narrowed towards the obtuse apex, puberulous, 1·6–2 cm. long and 4 mm. wide, *Stamens* 1 mm. long, the connectives flat-topped. *Ovaries* many, glabrous, oblong; stigma elliptic-ovoid equalling the ovary. *Ripe carpels* dull-red, later black with a soft, juicy, sweetish pulp, spherical, glabrous, 1·3 cm. × 1·3 cm.; stalks thin, 1·3–1·5 cm. long, glabrous. *Seed* 1, surface wrinkled or slightly pitted, a groove round the circumference.

SELANGOR: Klang River, *Symington 44012* (K.).

JOHORE: Sungei Kayu, Mawai-Jemaluang Road, *Corner, 14th April, 1935* (S.); Sungei Sedili, *Corner S.F.N. 29274* (S., K., Kew).

SINGAPORE: Mandai Road, *Holttum S.F.N. 37706* (S.); *Kiah S.F.N. 37120* (S.); *Corner S.F.N. 34448* (S.); Jurong, *Corner S.F.N. 26099* (S., K., C., Kew).

DISTRIBUTION: Sumatra, Java, Celebes, Philippines and New Guinea.

A tree of the swamp forest. It is distinguished from *P. sumatrana* by the smaller flowers and the spherical carpels with thinner stalks and pedicels. In most cases it is hardly possible to distinguish the two from leaf characters only but the leaves of *P. glauca* are sometimes slightly more coriaceous. *P. hypoleuca* resembles it too but the carpels of *hypoleuca* are elliptic-oblong, the flowers slightly smaller and the pedicels shorter, 2–5 mm. long. The leaves are smaller and the venation finer.

P. Parkinsonii from the Andamans also falls into this group. The leaves are similar to *P. sumatrana, glauca* and *hypoleuca* by having the secondary veins as thick as the primary ones. The carpels are globose and the petals linear, tomentose and obtuse at the apex.

(32) **P. longifolia** (Sonnerat) Thwaites, Enum. (1864) 398; Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 62; King in Ann. Roy. Bot. Gard. Calc. 4 (1893) 72 Pl. 99; Trimen, Hand-Book, Fl. Ceylon 1 (1893) 24; Corner, Wayside Trees of Malaya 1 (1940) 135 Text-Fig. 37, Vol. 2 Pl. 18.

Basonym: Uvaria longifolia Sonnerat, Voyage aux Indes Vol. 2 (1782) 233 T. 131; Lamk. Encycl. (1785) 597; Vahl, Symbolae Bot. 3 (1794) 72; Roxb. Fl. Ind. 2 (1832) 664.

Synonyms: Guatteria longifolia Wall. Cat. 6442 (1832); Thwaites Enum. (1858) 10; Hk. f. et Th. Fl. Ind. 1 (1855) 139. *Unona longifolia* Dun. Anon. (1817) 109.

Tree about 15 m. high with a straight trunk. *Twigs* glabrous, finely striate and dark-coloured. *Leaves* stiffly membranous, dark glossy-green above, paler beneath, glabrous, narrowly lanceolate, acuminate, the base cuneate, the edges wavy; main nerves 20–35 pairs, fine on both surfaces, gradually ascending; reticulations visible with a lens; length 11–20 cm.; 2–3·8 cm. broad just above base; petiole 4–7 mm. long. *Flowers* not scented, usually very numerous in fascicles or on short peduncles from the axils of leaves or fallen leaves; peduncles 1–1·5 cm. long, pedicels slender, 2–2·5 cm. long with a median, obtuse, pubescent bract 1 mm. long. *Sepals* broadly triangular, 3 mm. long, connate at base, pubescent, apex acute or slightly obtuse, reflexed. *Petals* greenish-yellow, sub-equal with broad base, 1·3–1·5 cm. long, spreading, tapering gradually to the acute apex, puberulous on both surfaces except base inside. *Stamens* 1 mm. long with convex-topped connectives. *Ovaries* 1·5 mm. long, glabrous, angled, stigma rectangular or oblong, pubescent, sessile with a groove on inner side

which is continued down inner side of ovary. *Ripe carpels* numerous, stalked, ovoid, obtuse at both ends, glabrous, ripening yellowish, then reddish and finally black, 2 cm. long and 1·4 cm. in diam.; stalk stout, 0·8–1 cm. long. *Seed* pale brown, filling the carpel, having the usual longitudinal groove.

PENANG: Cemetery, *Corner, 19th July, 1936* (S.).

SELANGOR: Kuala Lumpur, *Hamid C.F. 2588* (S.); Selangor Club, Kuala Lumpur, *Ahmad C.F. 4927* (S., K., Kew); *Hamid C.F. 2842* (K.); Kuala Lumpur, *Symington 30766* (K.).

DISTRIBUTION: Native in India and Ceylon. Often planted as a shade tree. Not native in Malaya. Type in Herb. Kew is *Wall. Cat. 6442.*

Excluded Species

P. montana Ridley in Journ. Linn. Soc. Bot. 41 (1913) 288; F.M.P. 1 (1922) 55.

I have failed to trace Ridley's type, *Kloss,* Ulu Langat, Selangor, sine numero, in Kew, Calcutta or Singapore. However a specimen in Herb. Kew labelled *Polyalthia parviflora*, collected by C. B. Kloss in Ulu Langat Selangor is *Trivalvaria pumila*. Ridley probably intended this to be *Polyalthia montana* but the name *P. montana* is not written on this sheet. There may be a duplicate yet to be traced in some other herbarium bearing the name *P. montana*. My reason for thinking that he meant this sheet to be *P. montana* is as follows. In his published description he says nearest to *P. dumosa,* which the Kew sheet superficially resembles. He also states that most of the flowers on the specimen appear to be unisexual and male having no pistils, a condition which we do find in *Trivalvaria.*

17. **CANANGA** Hk. f. et Th. Fl. Ind. 1 (1855) 130 non Aubl. (nom. conserv.).

Trees. *Flowers* large, greenish-yellow, fragrant, on short or very short axillary peduncles. *Sepals* 3, ovate or triangular, valvate. *Petals* 6, valvate, flat, strap-shaped, several-veined, spreading, the inner series sub-equal or slightly smaller. *Stamens* linear, about 3 mm. long, the connective produced to about one third the length of the stamen and apiculate; anthers lateral or sub-introrse. *Ovaries* many, oblong; style slender, stigmas agglutinated, forming a pileate, convex, lamellate disc, each separate stigma club-shaped, with a U-shaped groove continued down the inner side of ovary; ovules indefinite. *Ripe carpels* oblong, pulpy, stalked. *Seeds* several in 2 rows, pitted, sending spinous processes into the albumen.

TYPE OF GENUS: *Cananga odorata* (Lamk.) Hk. f. et Th. Fl. Ind. 1 (1855) 130.

DISTRIBUTION: Tropical Asia to N. Australia. Species 2.

This genus is allied to *Polyalthia* and *Desmos*. A similarity is found in the spreading strap-shaped petals which surround the sexual organs but do not press closely over them all the time as in *Cyathocalyx* and *Artabotrys*. The outstanding characters are its apiculate stamens and the pitted seeds. The several seeds in 2 rows suggest alliance with *Cyathocalyx* and probably to a less extent with *Artabotrys* which has 2 collateral seeds. The agglutinated, lamellate stigmas united to form a pileate disc recall what is found in *Cyathocalyx*. In all four genera the groove running down the inner side of the ovary from the stigma is well-marked.

KEY

a. Leaves oblong to broadly elliptic, rounded or cuneate at base, pubescent on the veins beneath or nearly glabrous. Flowers on leafless, 2–3 cm. long, axillary shoots (peduncles) (1) **C. odorata**

a. Leaves sub-rotund or broadly ovate-oblong, base shallow-cordate, densely tomentose beneath. Flowers on longer leafy axillary shoots (peduncles) (2) **C. latifolia**

(1) **C. odorata** (Lamk.) Hk. f. et Th. Fl. Ind. 1 (1855) 130 et in Fl. Br. Ind. 1 (1872) 56; Ast in Suppl. Fl. Générale de L'Indo-Chine 1 Fasc. 1 (1938) 69; Sinclair in Sarawak Mus. Journ. 5/3 (1951) 598.

Basonym: Uvaria odorata Lamk. Encycl. 1 (1785) 595.

Synonyms: Canangium odoratum King, Mat. F.M.P. Vol. 1 No. 4 (1892) 290 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 51 Pl. 67; Ridley, F.M.P. 1 (1922) 43; Craib, Fl. Siam. Enum. 1 (1925) 36; Corner in Gardens' Bull. Str. Settl. 10 (1938) 13 et in Wayside Trees of Malaya (1940) 131. *C. Scortechinii* King, Mat. F.M.P. Vol. 1 No. 4 (1892) 291 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 51; Corner in Gardens' Bull. Str. Settl. 10 (1938) 14; *Unona odorata* Baill. Hist. des Plantes 1 (1868) 213 et English Edit. 1 (1871) 202.

Tree 6–33 m. high with pale grey bark, the branch scars prominent, the branches all at the top of the tree, drooping or slightly erect with dangling leaf-twigs. *Young twigs* minutely pubescent, later glabrous, dark-coloured and striate. *Leaves* membranous, in two ranks, often drying black, oblong to broadly elliptic, the

edges nearly parallel, base rounded, often unequal-sided, less often cuneate, apex acute or acuminate, pubescent on the veins and midrib above and below; midrib slightly raised or flush with the upper surface, prominent below; main nerves 8–9 pairs, straight, ascending very steeply, prominent on both surfaces; reticulations fine but visible on both surfaces; some scalariform and others forming a loose network; length 10–20 cm.; breadth 4–9 cm.; petiole 1–1·5 cm. long, pubescent. *Flowers* very fragrant, pendulous, several in racemes on short, woody, axillary, 2–3 cm. long peduncles. *Pedicels* 3–5 cm. long, pubescent with 2 minute, deciduous bracts, one sub-medial and the other basal. *Sepals* 7 mm. long, ovate, acute, united at the base, apex reflexed, pubescent on both sides. *Petals* linear, strap-shaped, green at first, then yellow with a purple-brown spot at base inside, 5–7·5 cm. long and 5–7 mm. broad, acute, several-veined, minutely pubescent on both sides, claw small, tomentose. *Stamens* numerous, 3 mm. long with lateral anthers and apiculate connectives produced 1 mm. beyond the anthers. *Young* ovaries 4 mm. long, oblong, glabrous; stigmas club-shaped, lamellate, fused with a U-shaped groove on inner side running down to base of ovary to form a convex, pileate disc. *Ripe carpels*, oblong-obovoid, 1·5–2·3 cm. long, glabrous, nearly black when ripe, pulpy; stalks 1·2–1·8 cm. long. *Seeds* 2–12 in 2 rows, pale brown with pitted surface.

DISTRIBUTION: Eastern Tropics from India to North Queensland and Philippines. Throughout Malaya.

Corner states that this species occurs in two forms in Malaya, a wild state and the cultivated. The wild is common in the forests from Negri Sembilan to Kedah and Kelantan and differs from the cultivated in having rather rank-smelling flowers and apparently smaller fruiting carpels containing fewer seeds and more numerous carpels to the flower. In leaf, flower, bark, fruit and seed structure the wild and the cultivated forms are identical.

C. odorata var. **fruticosa** (Craib) J. Sinclair in Sarawak Mus. Journ. Vol. 5 No. 3 (1951) 599.

Synonyms: Canangium fruticosum Craib in Kew Bull. (1922) 166. *Canangium odoratum* var. *fruticosum* (Craib) Corner in Gard. Bull. Str. Settl. 10 (1939) 15.

A dwarf cultivated variety reaching about 2 m. only. It often has supernumerary petals and never sets fruit. Not known in the wild state. *Kerr 3219* and *4435* from Siam as type material in Herb. Kew.

(2) **C. latifolia** (Hk. f. et Th.) Finet et Gagnep. in Bull. Soc. Bot. Fr. Mém. 4 (1906) 84 et Fl. L'Ind.-Chine (1879) 64 Fig. 9; Ast in Suppl. Fl. L'Ind.-Chine 1 Fasc. 1 (1938) 69.

Basonym: Unona latifolia Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 60; King in Ann. Roy. Bot. Gard. Calc. 4 (1893) 58 Pl. 78.

Synonyms: U. Brandisana Pierre Fl. For. Cochinch. (1880) T. 19. *Canangium Brandisanum* Safford in Bull. Torr. Bot. Club 39 (1912) 504. *C. latifolium* Ridley, F.M.P. 1 (1922) 44; Craib, Fl. Siam. Enum. 1 (1925) 36.

Tree 10–20 m. high. *Young twigs* tomentose, later dark-coloured and striate. *Leaves* membranous, sub-rotund or broadly ovate-oblong, base broad and shallow-cordate, apex obtuse or mucronate, upper surface adpressed-pubescent on the nerves, tending to become glabrous, lower cinereous-tomentose; main nerves 10–11 pairs, straight, steeply ascending, prominent on both sides; reticulations prominent on lower surface, some scalariform, others forming a loose network; length 9–15 cm.; breadth 8·5–12 cm.; petiole 1–1·5 cm. long, tomentose. *Flowers* fragrant, borne on short, leafy, axillary branches, but their pedicels are below the leaves on these, not axillary (the leafy branches may represent the shorter woody peduncles found in *C. odorata*). *Pedicels* 1·5–2 cm. long, tomentose with a median bract. *Sepals* 1·2 cm. long, oblong-ovate, acute, connate at base, reflexed, tomentose. *Petals* greenish, 5 cm. long and 1·5–1·7 cm. broad, oblong-lanceolate, several-veined, tomentose, blade narrowed at junction with claw, spreading. *Stamens* 3 mm. long with apiculate connectives. *Ovaries* numerous, glabrous, oblong, 4 mm. long; stigmas agglutinated, shape as in *C. odorata*. *Ripe carpels* glabrous, slightly oblique, oblong, 1·4 cm. long; stalks 1 cm. long. *Seeds* 2–4 in 2 rows.

PERLIS: Besih Hangat, *Ridley 15170* (S., C., Kew).
KEDAH: Trutow, Langkawi, *Curtis 2807* (S., C., Kew).
DISTRIBUTION: Burma, Siam and Indo-China.

Confined to the extreme north of Malaya. This species is easily distinguished from *C. odorata* by its silvery, tomentose leaves. It also differs from *C. odorata* in having the leafy, axillary flowering shoots longer (peduncles). The shoots in *C. odorata* are leafless but much shorter. The connectives of the stamens in *C. odorata* are more finely pointed.

The leaves of *Miliusa velutina* and *M. tomentosa* (*Saccopetalum*) at times look very like those of *C. latifolia* especially those of the former when they are cordate at the base. The distinguishing characters of *C. latifolia* however are the silvery colour of the tomentum and the many, regular, scalariform reticulations.

18. MEZZETTIA Beccari Nuov. Giorn. Bot. Ital. 3 (1871) 187 including *Lonchomera* Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 93.

Tall trees. *Leaves* coriaceous, with midrib broad and flat above, flush with upper surface and prominent beneath. *Flowers* small, greenish, axillary, fasciculate or umbellate. *Sepals* 3, valvate, small. *Petals* 6, valvate, opening late and accrescent, spreading, flat, linear, the inner smaller than the outer. *Stamens* 9–12 with introrse anthers, the connectives truncate and concealing the anther cells from above. *Torus* small, slightly concave, pubescent. *Ovary* single, flask-shaped, tapering into the stigma; stigma flat on top, horse-shoe-shaped with a lateral groove running down ovary to its base. *Ovules* 2, superposed. *Carpel* elliptic or globose with hard walls. *Seeds* 2, large, compressed.

TYPE OF GENUS: *M. umbellata* Becc. in Nuov. Giorn. Bot. Ital. 3 (1871) 187.

DISTRIBUTION: Malaya and Borneo. Species 7.

Probably an off-shoot of *Polyalthia*. There is some similarity also to *Cananga*. All three genera have spreading petals. *Mezzettia* differs in having a single carpel.

KEY

a. Leaves coriaceous. Petals about 1 cm. long

b. Outer petals linear, acute (1) **M. leptopoda**

b. Outer petals ovate-lanceolate, obtuse (2) **M. Herveyana**

a. Leaves thinly coriaceous. Petals about 7 mm. long or less (3) **M. Curtisii**

(1) **M. leptopoda** (Hk. f. et Th.) Oliv. in Hook. Ic. Pl. (1887) T. 1560; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 378 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 168 Pl. 216B; Ridley, F.M.P. 1 (1922) 100.

Basonym: Lonchomera leptopoda Hk. f. et Th. Fl. Br. Ind. 1 (1872) 94.

Tall monopodial tree 25–40 m. high without buttresses, bark dark grey, smooth, crown conical, occupying about a fifth of the tree. *Young twigs* glabrous, striate and with transverse, slit-like lenticels. *Leaves* coriaceous, dark green, glossy, with revolute margins, elliptic or oblong, acute at the apex and base, glabrous; midrib broad and flattened above, flush with the upper surface, beneath raised and prominent, main nerves about 9 pairs, fine but raised on both surfaces, nearly horizontal, joining with each other and

with the reticulations some distance from the margin; reticulations as distinct as the nerves; length 9–11 cm.; breadth 4–5 cm.; petiole 7 mm. long, passing gradually into the blade. *Flowers* greenish-yellow in axillary fascicles of 2–6. *Pedicels* pubescent, 1–1·5 cm. long with a minute, basal, obtuse bract. *Sepals* broadly ovate, minutely pubescent on both sides, 2 mm. long, acute with reflexed tips, free almost to the base. *Petals* linear, acute, 1–1·2 cm. long and 1·5–2 mm. broad, increasing in length as sexual organs ripen, inner shorter in length, tomentose on both surfaces except at the very base inside. *Stamens* 9–15, introrse, 1 mm. long or less, connectives flat-topped, covering the anther cells above. *Ovary* single, flask-shaped, about 2 mm. long, passing gradually into the neck-like stigma which is flat and horse-shoe-shaped on top with a lateral groove running down ovary to its base; ovules 2. *Torus* flat. *Fruit* globose with a resinous odour, pulpy, about 6 cm. in diameter, black when dry with hard, thick wall, sessile. *Seeds* 2, about 3 cm. long, ovoid, oblong, with flat inner surface. **Fig. 22.**

PERAK: Kroh F.R., Compt. 26, *Durant 28727* (K.); *Symington 31045* (K.); *D.F.O. Btg. Padang 33952* (K.).

PAHANG: Bukit Kajang, *Corner S.F.N. 30569* (S.); Pamah Guntil, Kuantan, *District Forest Officer 15646* (S., K.); Bukit Goh F.R., *Ismail 17325* (K.).

SELANGOR: Ulu Gombak, *Shamoudin 18246* (S., K., Kew); *Hume 9689* (S.); 21st mile Ulu Gombak-Kuala Lumpur road, *Ja'amat* and *Sow 37300* (K.); Sungei Buloh, *Ja'amat 15262* (K.); Rantau Panjang F.R., Rawang, Comp. 9, *Ngah 24935* (K.); Compt. 13, *Carrier 24947* and *24948* (K.); Block 8, C area, *Md. Yusus 28910* (K.); Compt. *14, Ngah 32319* (K.); Compt. 10b, *Symington 32662* (K.); 29th mile, *Symington 43275* (K.); *Desch 32294* (K.); Jeram Padang, *Symington 43529* (K.).

NEGRI SEMBILAN: S. Menyala F.R., Port Dickson, *Wyatt-Smith 64847* and *64809* (K.).

MALACCA: *Maingay 102* (C., Kew) type material.

JOHORE: Sungei Kayu, *Kiah S.F.N. 32073* (S., K., Kew); 18th mile and 13½ mile Mawai-Jemaluang Road, *Corner S.F.N. 32986* (S., K.) and *29417* (S., C., K., Kew).

SINGAPORE: Mandai Road, *Corner S.F.N. 33147* (S., K., C., Kew); Bukit Timah, *Ngadiman S.F.N. 34623* (S., Kew); *36199* (S., K., Kew); *36461* (S., K., Kew); Bajau, *Ridley, date 1894;* Garden Jungle, *Ridley 4409* (S.) and *5992* (S., C., Kew); *Cantley,* no exact locality or date (S.).

DISTRIBUTION: Malaya and Borneo.

(2) **M. Herveyana** Oliv. in Hook. Ic. Pl. (1887) T. 1560; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 378 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 168 Pl. 217A; Ridley, F.M.P. 1 (1922) 101.

Tree. *Young branches* rather stout, nodose, glabrous. *Leaves* coriaceous, elliptic-oblong, shortly acuminate, the base cuneate;

both surfaces glabrous, the upper shining; main nerves about 10 pairs, spreading, interarching within the margin, faint; length 6·5–7·5 cm.; breadth 2·5–3 cm.; petiole 7–9 mm. long. *Flowers* 1 cm. long, rather crowded in sessile, axillary fascicles of 3–8; pedicels 7 mm. long, puberulous, ebracteolate. *Sepals* broadly ovate, obtuse, connate at the base, pubescent like the petals. *Outer petals* ovate, obtuse, flat; the inner smaller, broadly elliptic, obtuse, the tips incurved. *Anthers* about 12, sessile, obovate-quadrate. *Ovary*

Fig. 22. *Mezzettia leptopoda* (Hk. f. et Th.) Oliver.
A, Flowering twig. B, Flower. C, Calyx. D, Outer petal. E, Inner petal. F, Stamen, front view. G, Gynoecium.

oblong, tapering gradually into the style; ovules 2, superposed. *Ripe carpels* unknown.

MALACCA: *Hervey* (C., Kew) type.

There is no material of this rare tree in the Singapore Herbarium and it does not appear to have been collected again. In leaf it closely resembles *M. Curtisii* but the ovate petals are distinct.

(3) **M. Curtisii** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 378 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 168 Pl. 217B; Ridley, F.M.P. 1 (1922) 101.

Tree 10–16 m. high. *Young twigs* glabrous, striate. *Leaves* thinly coriaceous, oblong-lanceolate, apex acuminate, base acute, glabrous, black when dry, upper surface shining, lower dull; midrib and the 10 pairs of sub-horizontal nerves as in *M. leptopoda;* length 6·5–12·5 cm.; breadth 1·2–3·8 cm.; petiole 5–7 mm. long. *Flowers* 5–7 mm. long in axillary fascicles of 5–10. *Pedicels* slender, pubescent, about 1 cm. long with a minute, obtuse bract at base. *Sepals* 1 mm. long, semi-orbicular with reflexed sub-acute apices, tomentose on both surfaces and connate at the very base. *Outer petals* ligulate, acute, tomentose on both surfaces except inside at the base, about 5 mm. long, probably longer, *inner* similar but more obtuse and shorter, 3 mm. long. *Stamens* 10–12, 1 mm. long or less with connectives as in *M. leptopoda. Ovary* single, similar to that of *M. leptopoda. Ripe carpels* sessile, subglobose with a waxy bloom, 3·7–5 cm. in diam. *Seeds* 2, oblong, sub-compressed, about 2·5 cm. long.

KEDAH: Koh Mai F.R., *Awang 47818* (K.).

PENANG: Government Hill, *Curtis 2266* (S., C., Kew) type material; *Sinclair S.F.N. 39049* (S., E., Kew).

SELANGOR: Bukit Lagong, *Sow* and *Motan* Nos. *52125; 51983* (K.).

DISTRIBUTION: Confined to Malaya.

Rare. Differs from *M. leptopoda* in the thinner and narrower leaves and in the shorter petals.

19. DISEPALUM Hk. f. Trans. Linn. Soc. 23 (1862) 156 T. 20A.

Shrubs, usually on mountains. *Twigs* reddish-brown. *Leaves* recalling those of *Anaxagorea,* glabrous, the margins slightly revolute and the midrib sharply angled on the lower surface. *Inflorescence* on terminal pedicels. *Flowers* hermaphrodite, fragrant, red, or yellow tinged with red. *Sepals* valvate, 2–3, often reflexed.

Petals valvate, normally 6 or 4 but sometimes abnormally 5, 7, 8, or 10, acute or obtuse, spathulate, linear or elliptic, free to the base or united into a deep or a shallow cup; the corolla sometimes separated from the calyx by a short stalk or constriction. *Stamens* numerous, rather elongated or linear with convex, orbicular connectives. *Ovaries* numerous, pubescent, 4-angled; style 4-angled, about as long as ovary with a faint groove running to base of ovary; stigma minute, convex, slightly pubescent. *Torus* massive, woody. *Ripe carpels* numerous, ovoid-oblong, thin-walled; stalks obliquely clavate where they join the carpels. *Seeds* 1–2, dark reddish-brown, shining.

TYPE OF GENUS: *D. anomalum* Hk. f. Trans. Linn. Soc. 23 (1862) 156 T. 20A.

DISTRIBUTION: Malay Peninsula, Borneo and Sumatra. Species 6.

When making a key for *Polyalthia* I found owing to the inflorescence, structure of the flower and other details great difficulty in finding a place for *Polyalthia pulchra*. On closer examination it was found that the essential parts of the flower, the stamens and ovaries, were exactly similar in detail to those of *Disepalum* so the logical place for it was in this genus. Airy-Shaw in Kew Bull. (1939) 290 is also of the opinion that there is a relationship.

The leaves of this species are very similar to *D. anomalum* although they are larger and the venation is more pronounced. The fruit too is very similar, the carpel stalks being a little stouter —*D. pulchrum* is a mountain plant found at high elevations in Malaya, 4,000 feet and over, while *D. anomalum* has been found on the top of Gunong Panti in Johore 1,580 feet.

D. anomalum differs in the reduction of the sepals to 2 and the petals to 4 and in the union of the latter into a cup.

This reduction however is in an unstable state and reversion to the normal Annonaceous floral formula does take place. *D. coronatum* Becc. illustrates this case very well. *D. coronatum* normally has 2 sepals and 6 petals but the following herbarium sheets in the Kuching Museum, Sarawak, exhibit an interesting set of conditions.

(1) *Hewitt,* September 1907, Baram *D. 18·6* has 3 sepals and 7 petals.

(2) *Garai* (*Haviland*) $\frac{2520.}{2024}$ This sheet has 3 flowers each with 2 sepals but one flower has 5 petals instead of 6.

(3) *Garai* $\frac{1987.}{1502}$ One flower has 2 sepals and 8 petals.

In Herb. Kew the type sheet of *D. coronatum, Beccari 1722* has 2 sepals and 10 petals. Similar instances of incipient reduction tending to revert to the normal are found in *Desmos dasymaschalus*. See notes under *Desmos*. Regarding union of petals into a cup, *D. coronatum* is intermediate between the free condition of *D. pulchrum* and the deep cup of *D. anomalum*. *D. coronatum* has linear, acute petals which are free far down, eventually uniting to form a cup but it is much shallower than that of *D. anomalum*.

The choice of the word *Disepalum* is therefore rather an unhappy one since three as well as two sepals occur in the genus. *Disepalum* is an offshoot from *Polyalthia*. See notes under *Polyalthia*.

KEY

a. Sepals 2. Corolla with 4 spathulate lobes united in a cup at base. Carpels 1·2 cm. long, their stalks 1–1·5 mm. thick. Leaves 9–10·5 cm. long and 3–4 cm. wide
(1) **D. anomalum**

a. Sepals 3. Corolla lobes 6 free to base. Carpels 1·7–2·3 cm. long, their stalks 2–3 mm. thick. Leaves 13–18 cm. long and 4–8 cm. wide.

b. Petals 2·5–3·8 cm. long. Width of leaf 5·5–8 cm.
(2) **D. pulchrum** typical form

b. Petals 5 cm. long. Width of leaf 4–5 cm.
pulchrum var. **angustifolium**

(1) **D. anomalum** Hk. f. Trans. Linn. Soc. 23 (1862) 156 T. 20A; Ridley in Sarawak Mus. Journ. 1/3 (1913) 83; Merrill in Journ. Roy. As. Soc. Str. Br. (1921) 258; Ridley, F.M.P. 1 (1922) 63 Fig. 7.

Synonym: D. longipes King, Mat. F.M.P. Vol. 1 No. 4 (1892) 318 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 86 Pl. 118B.

Tree or shrub 5–10 m. high. *Young twigs* glabrous, dark reddish-brown, striate. *Leaves* rather similar to those of *Anaxagorea javanica,* membranous, glabrous, oblong to oblong-obovate, acute or slightly acuminate, the actual tip blunt c.f. *Anaxagorea,* the base acute, and slightly winged down to the petiole, the edges slightly revolute as in *Anaxagorea* and the lower midrib similarly sharp-angled and roughened; main nerves also of the pattern of *Anaxagorea* but less distinct, 7–10 pairs, fine on both surfaces, sub-horizontal, anastomosing 5 mm. from the margin, the secondary slightly shorter and often not distinct from the primary; reticulations most often not visible; length 9–10·5 cm.; breadth 3–4

cm.; petiole slightly verrucose as in *Anaxagorea,* 7 mm. long. *Pedicels* terminal, solitary or up to 5, slender, ebracteolate, glabrous, 5–6 cm. long. *Sepals* 2, coriaceous, glabrous, reflexed, concave inside, convex outside, ovate-rotund, blunt, faintly 3-veined, 1 cm. long. *Petals* fleshy, red, glabrous, united at base into a cup which holds the stamens and ovaries, 4-lobed above cup, the lobes remote, linear-spathulate, obtuse, 6 mm. long and 1 mm. broad, the cup 5–6 mm. long. *Stamens* red, numerous, 1·5–2 mm. long, slightly elongated and not cuneate as in *Polyalthia,* the connectives convex, orbicular and granular. *Ovaries* 2·5 mm. long, 4-angled, pubescent; style 4-angled, about as long as ovary with faint groove running down to base of ovary, stigma very small on the top, slightly pubescent. *Ripe carpels* red, numerous up to 50, ovoid, glabrous, thin-walled, obtuse, 1·2 cm. long, the sepals and the petals often persisting with the fruit; stalks 4·5–5 cm. long, glabrous, obliquely clavate where they join the carpels. *Torus* massive. *Seeds* 1–2, dark reddish-brown, smooth, shining.

PERAK: Road to Sungei Ratan, Bruas, Dindings, *Curtis 3437* (S., Kew).

JOHORE: Gunong Panti, 1,500 feet to summit, *Corner S.F.N. 26170* (S., K., Kew); *Corner, 24th January, 1937* (S.); *Holttum S.F.N. 18071* (S.); *Ridley 4183* (S., C.); *King 231* type of *D. longipes* (Kew).

DISTRIBUTION: Sarawak and N. Borneo. Type of *D. anomalum* in Herb. Kew, *Lobb,* Sarawak, ex Herb. Hookerianum.

The leaves recall those of *Anaxagorea javanica* in several ways as indicated in the description but those of *Anaxagorea* are larger in proportion, more rounded at the base and the nerves are more distinct.

(2) **D. pulchrum** (King) J. Sinclair, **comb. nov.**

Basonym: Polyalthia pulchra King, Mat. F.M.P. Vol. 1 No. 4 (1892) 304 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 68 Pl. 94; Ridley, F.M.P. 1 (1922) 57.

Small tree. *Young twigs* glabrous, dark reddish-brown as in *D. anomalum,* closely striate. *Leaves* as in *D. anomalum* but larger in proportion and the venation and reticulations more prominent; the midrib beneath sharply angled and muriculate as in *P. anomalum* and *Anaxagorea javanica;* length 13–18 cm.; breadth 5·5–8 cm.; petioles 5–7 mm. long, pubescent. *Flowers* fragrant, terminal, solitary on 3·5–6 cm. long pedicels which have a caducous, 1·7 cm. long, foliaceous bract at base. *Sepals* 3, ovate, acute or somewhat blunt, several-veined, 1·5–2 cm. long. *Petals* 6, yellow or reddish-yellow, shading to red at base with a dark purple-red blotch at base inside, coriaceous, sub-equal, elliptic, sub-acute,

very minutely pubescent outside, glabrous inside, 2·5–3·8 cm. long. *Stamens* and connectives as in *D. anomalum*, but 3 mm. long, numerous in several rows. *Ovary*, style and stigma as in *D. anomalum* but a little longer, 3 mm. long. *Ripe carpels* numerous, on a massive woody torus, elliptic-ovoid to oblong, sparsely pubescent, later glabrous, thin-walled, red, 1·7–2·3 cm. long by 1 cm. broad; stalks stout, pink, obliquely clavate at point of attachment of carpels, 4·5–5 cm. long. *Seeds* 1–2, shining, dark reddish-brown.

PERAK: *Scortechini 824* (C., Kew) type material; Gunong Kerbau, *Robinson, June 1913* (S., Kew).

PAHANG: Teku River, *Ridley 16012* (S., Kew); Cameron Highlands, *Henderson S.F.N. 23288* (S., K.) and *F.M.S. Mus. Herb. 11157* (S.); *Batten-Pooll, November 1939–January 1940* (S.); near Tanah Rata, Cameron Highlands, *Henderson, S.F.N. 17736* (S.); *Ja'amat* and *Sow 36179* (K.); Mentigi Nursery, Cameron Highlands, *Durant 28734* (K.); Sungei Terla, *Holttum S.F.N. 31316* (S., K., Kew); Fraser Hill upon the Selangor Border, *Burkill* and *Holttum S.F.N. 8533* (S.); Sungei Terolak, *Ja'amat 77574* (S., K.); Ulu Sungei Lemoi, *Ja'amat 28116* (S., K.).

SELANGOR: Gunong Mengkuang, *Robinson, 4th January, 1913* (S.).

DISTRIBUTION: Confined to the Malay Peninsula on mountains.

var. **angustifolium** (King) J. Sinclair, **comb. nov.**

Syn: Polyalthia pulchra var. *angustifolia* King, Mat. F.M.P. Vol. 1 No. 4 (1892) 304 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 69; Ridley, F.M.P. 1 (1922) 57.

Leaves oblong-lanceolate or oblong-oblanceolate scarcely muriculate on lower midrib; breadth 4–5 cm. only. *Petals* lanceolate or narrowly oblong-lanceolate; length often 5 cm.; sepals, length 1·8 cm.

PERAK: Gunong Bubu, *Wray 3867* (S., C., Kew) type.

Tribe 3. XYLOPIEAE

Sepals and *petals* valvate. *Flower buds* triquetrous or cylindrical. *Petals* thick, coriaceous, usually lanceolate but also orbicular or ovate-oblong, concave at the base, the outer sometimes triquetrous, spreading, the inner nearly always triquetrous, not often spreading but remaining erect and touching each other, smaller than the outer. *Stamen connectives* slightly produced.

KEY TO THE GENERA OF THE XYLOPIEAE

a. Trees. Flowers axillary, anthers with large pollen grains visible with naked eye, appearing septate. Carpels several-seeded, indehiscent or rarely semi-dehiscent **20. Xylopia**

a. Trees. Flowers opposite the leaves or terminal (Asiatic species), anthers not appearing septate, pollen grains not visible with naked eye. Carpels two-seeded, dehiscent (follicles)
21. Anaxagorea

a. Climbers. Anthers not appearing septate, pollen grains not visible with naked eye

b. Flowers in terminal cymes or branched panicles, reticulations scalariform at right angles to nerves; secondary nerves absent **22. Fissistigma**

b. Flowers axillary, reticulations not scalariform; secondary nerves present

c. Petals linear-lanceolate, 5–8 cm. long, the inner ovate, 1 cm. long, calyx a circular or obscurely 3-angled collar, persistent in fruit; stigma capitate, multi-lobed
23. Pyramidanthe

c. Petals ovate, orbicular or oblong, not elongate, 8 mm.–1·2 cm. long only, the inner slightly smaller; calyx a 3-angled, connate cup, persistent; style not expanding into a stigmatic swelling

d. Seeds black, pitted **24. Mitrella**

d. Seeds smooth, shining **25. Melodorum**

20. XYLOPIA Linn. Syst. ed. 10 (1759) 1250 including *Habzelia* A.DC. in Mém. Soc. Phys. Genèv. 5 (1832) 207.

Shrubs or trees. *Flowers* hermaphrodite, axillary, solitary, cymose or fascicled, often fragrant; buds triquetrous or conic. *Sepals* 3, valvate, connate at base. *Petals* 6, valvate, in two series, linear, often elongated or ovate and not much longer than broad, the outer when linear, flat, 1-veined, concave at base, the inner nearly as long, narrower, triquetrous, concave at base. *Torus* flat or hollow enclosing the carpels. *Stamens* elongated, the anther transversely septate with large pollen grains, the connective produced, obtuse or pointed. *Ovaries* 1 or more, style filiform, stigma clavate, narrowly clavate or not broader than style. *Ripe carpels* elongated, cylindric or ovoid, oblong or obovoid. *Seeds* several (rarely 2), 1–2 seriate.

TYPE OF GENUS: *Xylopia* glabra Linn. Syst. ed. 10 (1759) 1250.

DISTRIBUTION: Tropics of Old and New World, numerous in Africa. About 100 species.

Xylopia is related to *Fissistigma*. Both have triquetrous or cylindric flower buds and the connectives of the stamens are produced in both. However there are a good many differences and

the relationship is not so very close. There is also some affinity with *Anaxagorea* (see notes under it).

The Malayan species are not difficult to distinguish. *X. caudata* has smaller leaves and flowers than any of the others. *X. malayana* has glabrous leaves and so has *X. sub-dehiscens* but in the latter they may be slightly puberulous when young. Further there is only one carpel in *X. sub-dehiscens*. Several species tend to have pubescent leaves but the pubescence wears off in old or mature leaves. The leaves of *X. ferruginea* are covered with a rusty-pubescence beneath which also tends to disappear in old leaves. *X. ferruginea* and *X. stenopetala* are recognized from the others by their long, cylindric fruits, and from each other by the more slender pedicels and flowers of *X. stenopetala*. *X. magna* has very long petals up to 10 cm. and its fruit resembles that of *X. fusca* but the leaves of *fusca* are of a beautiful, golden, shining colour beneath, at least when young. *X. sub-dehiscens* has ovate petals with thick edges, not the usual linear type of the Malayan species but this form is seen in some African and American species. Each species therefore has its own good distinguishing characteristics. The stamens and ovaries are remarkably uniform and vary little. The septate anthers and the filiform styles should distinguish this genus from others. Probably all the Malayan species have fragrant flowers although odour is not recorded by collectors for some of them.

KEY

a. Outer petals much longer than broad; carpels several

b. Leaves not glaucous beneath; carpels oblong, ovoid or obovoid but not narrow-elongate, length not more than 5 cm. usually less

c. Leaves golden sericeous, pubescent beneath, obtuse, usually obovate (1) **X. fusca**

c. Leaves not golden-sericeous beneath, acute or acuminate

d. Petals 8–10 cm. long (2) **X. magna**

d. Petals much less, usually not over 3 cm.

e. Leaves average length 3–5·5 cm. and breadth 1·8–2 cm. Petals 7–8 mm. long (3) **X. caudata**

e. Leaves much larger in area, 5–14 cm. long and 2·5–3 cm. broad. Petals 1·5–2 cm. long

f. Leaves glabrous, oblong-elliptic, widest at middle; pedicels 3 mm. long (4) **X. malayana**

f. Leaves slightly pubescent beneath, elliptic, not widest at middle; pedicels 2 mm. long (5) **X. elliptica**

b. Leaves glaucous or glaucescent beneath. Carpels elongate, cylindric 5–12·5 cm. long

g. Ripe carpels not moniliform when dry, 1·2 cm. in diam.; pedicels slender, 1·5–2 cm. long; petals 2 mm. broad (6) **X. stenopetala**

g. Ripe carpels sub-moniliform when dry, 6 mm. in diam.; pedicels stout, 8 mm.–1·5 cm. long; petals 3–5 mm. broad

h. Leaves narrow-oblong, acute, 3·5–4·5 cm. across with ferrugineous tomentum beneath, becoming almost glabrous (7) **X. ferruginea**

h. Leaves elliptic, ovate or oblong, 6·5–8 cm. across, slightly ferrugineous becoming glabrous **ferruginea** var. **oxyantha**

a. Outer petals not much longer than broad, ovate; carpels 1 (8) **X. sub-dehiscens**

(1) **X. fusca** *Maingay* ex Hk. f. et Th. Fl. Br. Ind. 1 (1872) 83; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 365 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 146 Pl. 190B; Ridley, F.M.P. 1 (1922) 92; Sinclair in Sarawak Mus. Journ. Vol. 5 No. 3 (1951) 609.

Synonyms: X. obtusifolia Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 83; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 368 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 150 Pl. 197A. *X. Havilandii* Ridley in Kew Bull. (1912) 388 et in Sarawak Mus. Journ. 1/3 (1913) 95.

Tree 20–30 m. high, with trunk about 55 cm. in diameter. *Young twigs,* glabrous, dark red, stout, buds silky. *Leaves* coriaceous, elliptic to oblong-obovate, obtuse with cuneate base, dark glossy-green above, at first covered with golden, closely adpressed, shining hairs beneath, later darker and glabrous; main nerves 8–9 pairs, oblique, faint on both surfaces as are the lax reticulations; length 5–10 cm.; breadth 2–4·5 cm.; petiole 5 mm. long. *Flowers* 1–3 axillary. *Peduncle* 3–5 mm. long; pedicels 3–5 mm. long with a minute, caducous bract at base. *Sepals* 3 mm. long, ovate, acute, united at middle to form a cup, adpressed-pubescent outside, glabrous inside. *Petals* slightly curved in bud, 1·7–2 cm. long, sub-equal, yellow, adpressed-sericeous, outer flat with a

central midrib, obtuse, 4 mm. broad; inner triquetrous, sub-acute, 1·5–2 mm. broad. *Stamens* 3 mm. long, elongate, septate with large grains, the connectives produced, obtuse or slightly pointed. *Ovaries* 2–3, about 4 mm. long with adpressed, silky hairs; style filiform not broadening into the stigma. *Ripe carpels* 2–3, oblong-cylindric with a blunt point, reddish-brown, 3–3·3 cm. long and 1 cm. in diam.; stalk thick, only 3 mm. long. *Seeds* 3–4 in 2 rows, globular.

PERAK: Larut, *King 2816* (S., Kew) type material of *X. obtusifolia.*

PAHANG: Sungei Bera near Tasek Bera, *Henderson S.F.N. 24120* (S., K.); Kuantan, *Soh 15131* (S., K.).

SELANGOR: Bukit Changgang sawmill, Klang, *Nur S.F.N. 33972* (S., K.).

MALACCA: *Griffith 386* (C.) type material of *X. obtusifolia; Maingay 86* (C., Kew) type material of *X. fusca.*

JOHORE: Sungei Sedili, *Ngadiman S.F.N. 36868* (S., K., Kew).

SINGAPORE: Jurong, *Corner S.F.N. 26096* (S., K., Kew); 14th mile Jurong Road, *Baker, 4th November, 1917* (S.); Mandai Road, *Corner S.F.N. 37115* (S.) and *S.F.N. 34531* (S., Kew).

DISTRIBUTION: Sarawak.

There should be no difficulty in recognizing this species by the golden lustre of the undersurface of the leaves. It grows by streams and in fresh water swamp forest.

(2) **X. magna** Maingay ex Hk. f. et Th. Fl. Br. Ind. 1 (1872) 84; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 369 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 151 Pl. 197B; Ridley, F.M.P. 1 (1922) 93.

Tree 13–20 m. high. *Young twigs* rusty-tomentose, later dark, glabrous and with numerous lenticels. *Leaves* coriaceous, minutely hyaline-punctate, ovate-oblong or elliptic, obtuse or bluntly acute, base rounded, the edges slightly revolute when dry, upper surface dark green, shining, glabrous except the slightly pubescent midrib, the lower medium green, sparsely pubescent, drying a dark brown; main nerves 10 pairs, faint above, more prominent beneath, oblique, anastomosing about 5 mm. from margin; reticulations fine and rather close; length 8–12 cm.; breadth 4–5·3 cm.; petiole 5–7 mm. long, pubescent. *Flowers* 8–10 cm. long, solitary or in pairs, axillary. *Pedicels* stout, tomentose 4 mm. long with an ovate, acute, amplexicaul bract at base. *Sepals* coriaceous, ovate, acute, forming a shallow cup, pubescent outside, glabrous inside, 3–4 mm. long. *Petals* 8–10 cm. long, linear, sub-equal, slightly expanded and concave at base, pale yellow, minutely tomentose except base inside, outer flat, 2 mm. broad, inner triquetrous, 1 mm. broad. *Stamens* 2·5 mm. long, elongate, septate, connectives

obtuse, produced. *Ovaries* 4 mm. long, about 15, narrowly oblique, hairy, style filiform with narrow-clavate stigma. *Ripe carpels* obovoid, obtuse at apex, minutely tomentose, with a ridge down one side, 2·5 cm. long and 1·8 cm. in diameter; stalks 5 mm. long, stout. *Seeds* about 4 in 2 rows.

KEDAH: Peranginan F.R., *Awang 31323* (K.).
PERAK: *Scortechini 2112* (S., C.); Larut, *King 3712* (S., C., Kew).
PAHANG: Kemansul F.R., Temerloh, *Hamid 10083* (S., K.).
SELANGOR: Pahang Track, *Ridley, July 1897* (S.).
NEGRI SEMBILAN: S. Menyala F.R., Port Dickson, *Wyatt-Smith 64728* (K.).
MALACCA: *Maingay 83* (C., Kew) type material; Bukit Bruang F.R., Compt. 13, *Saamin 14194* (K.); Selandor, *Ridley, date 1890* (S.).
SINGAPORE: Taban Path, Bukit Timah F.R., *Sinclair S.F.N. 39690* (S.).
DISTRIBUTION: Not recorded outside the Peninsula.

A good distinct species not likely to be confused with any other. The very long, linear-petals will at once identify this species.

(3) **X. caudata** Hk. f. et Th. Fl. Ind. (1855) 125 et in Fl. Br. Ind. 1 (1872) 85; Miq. Fl. Ind. Bat. 1 pt. 1 (1858) 38; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 366 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 148 Pl. 193B; Ridley, F.M.P. 1 (1922) 93; Sinclair in Sarawak Mus. Journ. (1951) 608.

Synonym: X. Tooropiana Scheff. in Tijdschr. Nederl. Ind. 32 (1871) 392.

Tree up to 16 m. high. *Young twigs* very slender and numerous, spreading, minutely pubescent, soon glabrous, reddish-brown and with numerous lenticels. *Leaves* thin but slightly coriaceous, elliptic-lanceolate, caudate but the extreme tip obtuse, base acute, glabrous above except the minutely pubescent midrib, sparingly adpressed-pubescent below, becoming glabrous; main nerves about 10 pairs, extremely fine and faint as are the reticulations and only distinguishable from the secondary nerves under a lens; length 3–6·5 cm.; breadth 1·8–2 cm.; petiole 2 mm. long. *Pedicels* 1–3, axillary, very short, about 1 mm. long, the flowers appearing almost sessile with 3 unequal, sub-orbicular, obtuse bracts at their base. *Sepals* ovate, slightly obtuse, pubescent outside, glabrous inside, united above base, 2 mm. long. *Petals* 7–8 mm. long, pale yellow, linear, adpressed-pubescent, glabrous at the concave base inside; outer flat, 1·5 mm. broad, the inner triquetrous, 0·8 mm. broad with 2 swellings at base where claw meets blade. *Stamens* 1 mm. long, connectives obtuse, pollen grains large. *Ovaries* 3, pubescent, 2 mm. long; style linear, stigma clavate. *Ripe carpels*

2–3, sub-globose or ovoid, pubescent, slightly wrinkled when dry, 1·2 cm. long, the apex lateral and obtusely pointed; stalks 2 mm. long. *Seeds* 2.

PAHANG: Temerloh, *Hamid C.F. 4857* (S., K., Kew); *C.F. 3735* (S., K.); *C.F. 5457* (S., K.); Kemansul F.R., *Hamid 10577* (S., K., E., Kew).

SELANGOR: Rantau Panjang, *Tachon 23285* (S., K.).

MALACCA: *Maingay 79* (C., Kew); *Maingay 80* (Kew); *Griffith 3861/1* (Kew) type material; Sungei Udang, *Goodenough 1375* (S.); Bukit Danau, *Alvins 587* (S.); Machap, *Derry 1173* (S., C.).

JOHORE: Bukit Piatu, S. Sedili, *Ngadiman S.F.N. 36881* (S., K., Kew); Ma'okil F.R., 5 miles south of Labis, *Sinclair S.F.N. 38993* (S., E.); 13½ miles Mawai-Jemaluang Road, *Corner S.F.N. 29413* (S., K., Kew); S. Kayu, Mawai-Jemaluang Road, *Corner S.F.N. 28729* (S., K., Kew).

SINGAPORE: Jurong 15th mile, *Corner S.F.N. 26030* (S., Kew); Bukit Timah, *Corner S.F.N. 34679* (S., K., D.D., Kew).

DISTRIBUTION: Borneo and Sumatra.

A distinct species. Flowers smaller than in the other Malayan species. Common in Johore.

(4) **X. malayana** Hk. f. et Th. Fl. Ind. (1855) 125 et in Fl. Br. Ind. 1 (1872) 83; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 364 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 145 Pl. 187B; Ridley in Sarawak Mus. Journ. 1/3 (1913) 93 et F.M.P. 1 (1922) 91; Merrill in Journ. Str. Br. Roy. As. Soc. (1921) 266.

Synonyms: X. Maingayi Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 85; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 364 et in Ann. Roy. Bot. Gard. Calc. 4 (1892) 146 Pl. 191A. *X. dicarpa* Hk. f. et Th. quoad specimen Maingay 84 tantum non King 7097. *X. mucronata* Boerl. in Icon. Bogor. 1 (1899) 122 and 207 T. 75. *X. pustulata* Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 85; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 365 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 146 Pl. 191B; Ridley, F.M.P. 1 (1922) 91. *Parartabotrys sumatrana* Miq. Fl. Ind. Bat. Suppl. (1861) 374; Scheffer in Nat. Tijdsch. Ned. Ind. 31 (1869) 15.

Tree 10–20 m. high with greyish-white bark. *Young twigs* often smooth, glabrous and with numerous lenticels. *Leaves* thinly coriaceous, glabrous, shining, oblong-elliptic, apex acute, base acute, drying brown; main nerves about 8 pairs, slender and faint, scarcely distinct from the secondary, interarching 4 mm. from margin; midrib sharply angled on lower surface; reticulations faint above, fine and lax beneath; length 8·5–14 cm.; breadth 3·5–6·3 cm.; petiole glabrous, dark-coloured, ringed, 7 mm.–1 cm. long. *Flowers* fragrant, 1–3, axillary with a 2 mm. long, amplexicaul, sub-orbicular bract and a 1 mm. long, lanceolate one both at the

base; pedicels 3 mm. long, often two, seated on 1 mm. long peduncle. *Sepals* broadly ovate, sub-acute, coriaceous, brown-pubescent outside, glabrous inside, united at base, 4 mm. long and 2·5 mm. broad. *Petals* 1·5–2·2 cm. long and 2–2·5 mm. broad, pale yellow, reddish inside at base, sub-equal, coriaceous, erect, later spreading slightly at apex, shortly pubescent except the glabrous, slightly concave base, sub-acute, the outer flat, linear, faintly keeled, the inner triquetrous. *Stamens* numerous, 2·5 mm. long, the anthers red, septate with large pollen grains, the connectives much produced, oblique, white, slightly pointed. *Ovaries* 2–6, densely sericeous, oblong-linear, 4 mm. long, the style as long as ovary, projecting above stamens; stigma narrow-clavate, white, slightly bent outwards, a faint groove running to base of ovary from top of stigma. *Torus* very small. *Ripe carpels* 3–4, pink, minutely brown-pubescent, ridged, wrinkled when dry, oblong-obovate, obtuse, 2–2·3 cm. long; stalks stout, 3 mm. long. *Seeds* 2–7 in 2 rows.

PERAK: Ulu Kal, *King 10727* (Kew).

PAHANG: Sungei Perting, Bentong, *Burkill* and *Haniff S.F.N. 16519* (S., D.D.); Pekan, *Burkill* and *Haniff S.F.N. 17247* (S.); Ulu Chineras, Kuala Lepis, *Burkill* and *Haniff S.F.N. 17079* (S.).

SELANGOR: Sepang, *Denny, 27th November, 1941* (S.); Sungei Pelek, Sepang, *Denny 116* (S.); Weld Hill F.R., *Symington 43632* (K.); *Hamid C.F. 715* (S., K.); Kepong Plantations, *Hamid 16412* (S., K.); Sungei Buloh, Compt. 12, *Symington 44729* (K.).

MALACCA: *Griffith* sine num. (C., Kew) and *Griffith 387* (Kew) both as type material; *Maingay 81* (C., Kew); *Maingay 82/2* (C., Kew) type of *X. pustulata; Maingay 84* (Kew) type of *X. dicarpa;* Brisu, *Derry 34* (S., C.); Merlimau, *Derry 942* (S.); Bukit Bruang, *Curtis 2501* (S., Kew); *Ridley 3532* (S.); Chirana Puteh, *Alvins 854* (S.); Ayer Panas, *Goodenough 1286* (S.).

JOHORE: Muar, *Curtis 3611* (S., Kew); Sungei Kayu, *Kiah S.F.N. 32403* (Kew).

SINGAPORE: *Maingay 84* (Kew); Mandai Road, *Kiah S.F.N. 37140* (S., K.) and *37147* (S., K., Kew); *Corner, 25th July, 1940* (S.); *Liew S.F.N. 37744* (S., K., Kew); Changi, *Ridley 5921* (S.); Bukit Arang, *Ridley, date 1894* (S.); Chan Chu Kang, *Ridley 6759* (S.); Bukit Timah, *Ridley 9838* (S., Kew); *Ngadiman S.F.N. 36125* (S., Kew); *S.F.N. 37003* (S., K., Kew); *S.F.N. 36457* (S.); *S.F.N. 37006* (S., K.); *Kiah S.F.N. 36499* (S., K., Kew); Jurong, *Goodenough 3866* (S., C., Kew); 15th mile, Jurong, *Corner, 21st February, 1933* (S.); *S.F.N. 26098* (S., Kew); Lornie Road, *Corner S.F.N. 36953* (S., K., Kew).

DISTRIBUTION: Sarawak, North Borneo and Sumatra.

Maingay 82/2, type of *X. pustulata*, is merely *X. malayana*. It is also numbered *1320* and is not to be confused with *Maingay 82* also numbered *2376* which is the type of *Xylopia elliptica*. Included also here is *X. dicarpa* Hk. f. et Th. but not the fruiting specimen of *King 7097* which is *Alphonsea Kingii*. (See notes under *Alphonsea*).

(5) **X. elliptica** Maingay ex Hk. f. et Th. Fl. Br. Ind. 1 (1872) 86; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 366 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 147 Pl. 193A; Ridley, F.M.P. 1 (1922) 92.

Tree 8–10 m. high. *Young twigs* dark-coloured, pubescent, with numerous lenticels, later glabrous. *Leaves* membranous, elliptic with nearly parallel sides, obtusely acuminate, the base rounded or slightly acute, glabrous above, minutely adpressed-pubescent below; main nerves 6–7 pairs, oblique, scarcely distinct from the secondary, faint on both surfaces; reticulations scarcely visible above, faint beneath; length 6·5–8 cm. and 2·5–3 cm. broad; petiole 7 mm. long, pubescent. *Flowers* axillary 1–2 with a minute, amplexicaul bract at base of calyx. *Peduncle* 3 mm. long; pedicels 2 mm. long (the peduncle 1 mm. long and the pedicels 3 mm. long in *X. malayana*). *Flower parts* as in *X. malayana* but smaller, the sepals and petals less coriaceous. *Sepals* 3 mm. long, pubescent outside, glabrous inside. *Petals* greenish-yellow, 2 cm. long when mature. *Stamens* 2 mm. long, elongate, septate, the connectives produced, rounded or slightly pointed. *Ovaries* 3, 2 mm. long, sericeous-pubescent; style linear, stigma clavate, grooved on one side. *Ripe carpels* oblong, 4 cm. long and 3·2 cm. in diameter, blunt at apex, thin-walled, somewhat asymmetrical, resembling those of *X. magna* but larger, sessile or stalked; stalks 2 mm. long. *Seeds* few in two rows with hard bone-like testa, 2 cm. × 1·2 cm.

KEDAH: Peranginan F.R., *Awang 42444* (K.).
PENANG: Sungei Penang, *Curtis 2482* (S., C., Kew) type material.
PERAK: Upper Perak, *Wray 3562* (S., C., Kew); *3194* (S., C.) type material.
PAHANG: Raub, *20309* no collector's name (K.) fruit.
SELANGOR: Bernam River, *Yeob 5037* (K.) fruit.
MALACCA: *Maingay 82* (C., Kew) type material.
DISTRIBUTION: Confined to Malaya.

This species is very close to *X. malayana* especially in the flowers, but they are smaller in all their parts. The peduncle is longer in *X. elliptica* and the pedicels shorter. The young twigs are pubescent and the leaves are narrower and not widest at the middle and are pubescent on the lower surface. The fruit is like that of *X. magna* but larger.

(6) **X. stenopetala** Oliv. in Hook. Icon. Plant. (1887) t. 1563; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 367 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 148 Pl. 194A; Ridley in Sarawak Mus. Journ. 1/3 (1913) 93; F.M.P. 1 (1922) 92.

Tree 16–20 m. high. *Young twigs* glabrous or very slightly pubescent, dark reddish or black and lenticels numerous. *Leaves*

thinly coriaceous, glabrous, sometimes very sparsely adpressed-pubescent on lower surface, shining on upper, glaucous or glaucescent on lower surface, elliptic-oblong, acute or shortly acuminate, base sub-cuneate; main nerves 10–12 pairs, fine but raised on both surfaces as are the lax reticulations, oblique; midrib flush with upper surface or slightly raised, sharply-angled below; length 9–12 cm.; breadth 3–5·5 cm.; petiole 3–5 mm. long. *Flowers* in fascicles arising from minute 1–2 mm. long peduncles or swellings in the axils of the leaves or fallen leaves; *pedicels* slender, rusty-puberulous, 1·5–2 cm. long with a minute obtuse bract below the middle. *Sepals* triangular, acute, forming a shallow cup, pubescent outside, glabrous inside, 2 mm. long. *Petals* linear, slightly expanded at the concave base, minutely tawny-pubescent, 2·8 cm. long and 2 mm. broad, the inner 1 mm. broad. *Stamens* 2–2.5 mm. long, connectives produced, obtuse or slightly pointed. *Ovaries* numerous, 3 mm. long, pubescent; style filiform, stigma subclavate. *Ripe carpels* cylindric, slightly falcate, obtuse, pericarp fleshy, much wrinkled longitudinally when dry, 5–10 cm. long and 1·2 cm. in diam.; stalks 8 mm. long, stout. *Seeds* several.

PENANG: Government Hill, *Curtis 857* (S., C., Kew) type material; *Curtis 880* (S., C., Kew) type material; Tunnel Road, *Henderson S.F.N. 21425* (S.); Government Hill Road, *Haniff S.F.N. 3706* (S., Kew).

DISTRIBUTION: Sarawak, Sumatra.

(7) **X. ferruginea** (Hk. f. et Th.) Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 83; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 369 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 151 Pl. 198; Ridley, F.M.P. 1 (1922) 93; Corner, Wayside Trees of Malaya 1 (1940) 136 Text-Fig. 38.

Basonym: Habzelia ferruginea Hk. f. et Th. Fl. Ind. 1 (1855) 123.

Synonym: Artabotrys malayanus Griff. Notul. 4 (1854) 713 non *X. malayana* Hk. f. et Th.

Tree 10–20 m. high, bark reddish-brown, tending to crack in small circular or hexagonal portions, wood white, stilt-roots present. *Young twigs* rusty-pubescent, later glabrous, dark reddish-brown, striate. *Leaves* coriaceous, shining and glabrous above, glaucous and purplish-brown-pubescent beneath, narrowly oblong, acute, base rounded or unequal-sided; nerves 12–14 pairs, raised on both surfaces, fine above, more prominent below, curving and anastomosing 3–5 mm. from margin, reticulations fine on both

surfaces, lax; length 9–16 cm.; breadth 2·7–5 cm.; petiole 5 mm. long, channelled. *Flowers* 1–3, axillary, fragrant. *Peduncle* 2–3 mm. long; *pedicels* 8 mm.–1·5 cm. long, rusty-pubescent with a small lanceolate bract near middle. *Sepals* 5 mm. long, broadly ovate, acute, rusty-pubescent outside, glabrous inside, united at base forming a shallow cup. *Petals* 5–6 cm. long, linear, ferrugineous-pubescent outside, cinereous-puberulous inside, glabrous on the concave base inside; outer flat, 3–5 mm. broad, 1-veined, inner 1–1·5 mm. broad, triquetrous. *Stamens* 2·5 mm. long with red, obtuse connectives ¼ length of stamen. *Ovaries* 3–4 cm. long, elongate, rusty-pubescent; style filiform tapering to the non-expanded stigma. *Torus* stout, hemispherical. *Ripe carpels* numerous, elongate, cylindric, becoming glabrous, acute at apex, sub-moniliform with longitudinal folds when dry; 5–12·5 cm. long and 6 mm. broad. *Seeds* several, oblong, rugose, 7 mm. long. **Fig. 23.**

DISTRIBUTION: Numerous dried specimens collected from all the provinces except Perlis, Penang, and Province Wellesley. Occurs in Siam, Borneo and Sumatra.

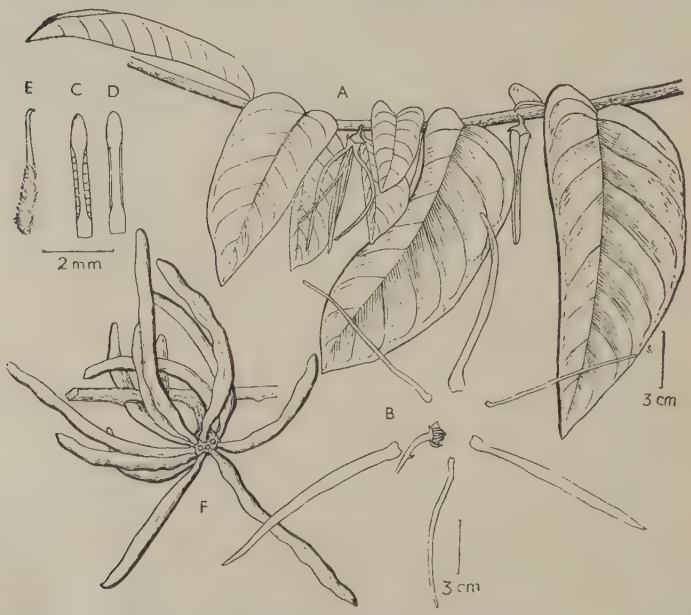


Fig. 23. *Xylopia ferruginea* (Hk. f. et Th.) Hk. f. et Th.
A, Flowering twig. B, Flower with petals detached. C, Stamen, front view. D, Stamen, back view. E, Gynoecium. F, Fruit.

var. **oxyantha** (Hk. f. et Th.) J. Sinclair, **stat. nov.**

Basonym: Habzelia oxyantha Hk. f. et Th. Fl. Ind. 1 (1855) 124.

Synonyms: X. oxyantha Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 83; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 363 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 144 Pl. 188. *Uvaria oxyantha* Wall. *nomen nudun,* Cat. 6478.

Leaves elliptic-ovate or oblong, 6·5–8 cm. across, slightly ferrugineous-puberulous beneath, becoming glabrous.

PAHANG: Kemansul F.R., *Forester 14099* and *14094* (S., K.).
SELANGOR: Rantau Panjang, *Symington 14482* and *40649* (K.).
NEGRI SEMBILAN: Selaru, *Ludin 1875* (S., K., Kew).
JOHORE: Sungei Sedili, *Ngadiman S.F.N. 36853* (S.).
SINGAPORE: *Wall. Cat. 6478* (C., Kew) type material; Sungei Morai, *Ridley 4558* (S., C.) and *3952* (S., C.); Changi, *Mat, date 1894* (S.); Seletar, *Ridley 6351* (S., C.).

I do not consider *X. oxyantha* distinct enough from *X. ferruginea* to be a species and have given it varietal rank here. *X. ferruginea* resembles *X. stenopetala* but the ripe carpels are not so broad nor so stout as in the latter. The outer petals are longer and broader in *X. ferruginea* and the pedicels stouter. Also the carpels are sub-moniliform when dry while those of *X. stenopetala* are not.

(8) **X. sub-dehiscens** (King) J. Sinclair, **comb. nov.**

Basonym: Alphonsea sub-dehiscens King, Mat. F.M.P. Vol. 1 No. 4 (1892) 375 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 164 Pl. 213; Ridley, F.M.P. 1 (1922) 98.

Shrub 5–7 m. high. *Young twigs* minutely pubescent, soon glabrous, striate. *Leaves* thinly coriaceous, medium green, shining on the upper surface, oblong to elliptic, acute or shortly acuminate, base rounded or sub-cuneate, glabrous above except the puberulous midrib, glabrous or sparsely puberulous beneath; main nerves 9–10 pairs, oblique, slender but visible on both surfaces, anastomosing doubly at margin; reticulations fine and lax on both surfaces; length 10–20 cm.; breadth 4–7 cm.; petiole 5–7 mm. long. *Flowers* axillary 1–2, nearly sessile, fragrant with the odour of ripe bananas, triquetrous in bud. *Pedicel* 2 mm. long with 3, suborbicular, pubescent bracts. *Sepals* coriaceous, ovate-orbicular, sub-acute, spreading, united to form a very shallow cup, pubescent outside, glabrous inside, 2·5 mm. long. *Petals* 8 mm.–1 cm. long, coriaceous, with thickened edges, ovate, acute, concave and glabrous at base inside, sericeous-pubescent outside, one-veined; outer cream-coloured with a brownish tinge, 6 mm. broad across middle;

the inner of the same colour but pink at base inside, slightly narrower. *Stamens* 2 mm. long, pink, septate, the connectives produced and obtuse. *Ovary* single, 2·5 mm. long, on a pyramid-like torus; style elongate and stigma club-shaped. *Ripe carpels* minutely tawny-pubescent, elongate with a ridge down one side, apex acute; length 2·5–4 cm.; diam. 1·2 cm.; stalk with several faint grooves, 1 cm. long. *Seeds* several in two rows with bony testa.

PENANG: Government Hill, *Curtis 1054* (S.); *July 1889; July 1890; July 1893* (S.).

PERAK: Ulu Bubong, *King 10079* (S., C.) type material; *10818* (C.) type material; Larut, *King 5313* (E.) type material; Maxwell's Hill, *Sinclair S.F.N. 38830* (S., E., Kew); Lumut, *Ridley 9434* (S.); also *date 1899* (S.); Telok Seru, Pangkore, *Curtis 1624* (S.).

PAHANG: Benta Road, *Soh 15090* (S., K.).

SELANGOR: Weld Hill Reserve, Kuala Lumpur, *Hamid 10464* (Kew).

JOHORE: Kampong Simpai Ulu, Batu Pahat, *Lake* and *Kelsall, October 1892* (S.); Bukit Kuing, Sedili Ketchil, *Corner, 23rd June, 1934* (S.); Bukit Tana Abang, *Lake* and *Kelsall, date 1892* (S.).

DISTRIBUTION: Not known outside Malaya.

Distinguished from the other Malayan species by the single carpel which resembles those of *X. vielana* (Indo-China) and by the shape of the flower buds which resemble the African *X. africana*. King wrongly placed this species in *Alphonsea* but the stamens, carpel and axillary flowers are those of *Xylopia*.

21. ANAXAGOREA St. Hillaire in Bull. Soc. Philom. de Paris (1825) 91 including *Rhopalocarpus* Teysm. et Binn. ex Miq. Ann. Mus. Bot. Lugd.-Bat. 2 (1865) 22 T. 2 fig. B et *Eburopetalum* Becc. Giorn. Bot. Ital. 3 (1871) 181; Sinclair in Sarawak Mus. Journ. Vol. 5 No. 3 (1951) 598.

Small trees or shrubs. *Flowers* terminal and extra-axillary (axillary in American species). *Sepals* 3 or 2, valvate, cohering below. *Petals* 6, valvate in two series or reduced to 3 or 2, spreading, thin or thickened especially round the edges; the inner subequal or slightly smaller. *Stamens* many, anthers extrorse, those next the carpels sterile or not, the connectives produced, slightly bent outwards, obtuse. *Ovaries* few or many; style of variable length, sometimes narrow and elongated, sometimes swollen and bent, having a U-shaped opening at the stigmatic part with a groove on anterior side. *Carpels* clavate follicles, stalked, dehiscing. *Seeds* 1–2, smooth, black, shining, collateral, basal or one slightly above the other, pointed where they taper into the stalk.

TYPE OF GENUS: *A. javanica* Bl. Fl. Jav. Anon. (1828) 66 T. 32 and 36A.

DISTRIBUTION: About 26 species mostly Central and South American, a few Asiatic, Ceylon, Burma, Siam, Indo-China, Borneo, Java, Sumatra and the Philippines.

The unique character is the dehiscent, follicular fruit. Sometimes in *Xylopia* we find a kind of semi-dehiscence. The shape of the carpel in *Xylopia* often recalls that of *Anaxagorea*, also the slender style, clavate or narrowly clavate at the stigmatic portion. The stamens with connectives slightly produced are similar in both but appear septate in *Xylopia* with large pollen masses. The petals of *Anaxagorea* recall those of some species of *Xylopia,* but the majority of the *Xylopia* species have the narrow, linear type. Both *Xylopia* and *Anaxagorea* are found in the Old and New Worlds. There seems to be a less apparent relationship with *Polyalthia.*

I have reduced *Eburopetalum* to *Anaxagorea.* [See Sarawak Museum Journal (1951) 598]. *A. luzonensis* of wide Asiatic distribution has not been found in Malaya.

A. javanica Bl. Fl. Jav. Anon. (1830) 66 T. 32 and 36A; Boerlage in Icon. Bogor. 1 (1899) 109; Corner in Gard. Bull. Str. Settl. 10 (1939) 12 et Wayside Trees of Malaya 1 (1940) 129 Text-Fig. 32.

Synonym: A. Scortechinii King, Mat. F.M.P. Vol. 1 No. 4 (1892) 317 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 85 Pl. 119; Ridley, F.M.P. 1 (1922) 62.

Shrub or small tree 4–6 m. high. *Bark* greyish. *Young twigs* green, glabrous. *Leaves* thinly coriaceous, elliptic or elliptic-oblong, acute or acuminate, base slightly acute, glabrous, dark green above, medium green beneath; main nerves 8–10 pairs, fine, prominent in older leaves, curving, interarching some distance from midrib; midrib on lower surface often slightly verrucose; reticulations not visible above in fresh leaves, faint in dried material, prominent beneath, forming a loose network; length 14–21 cm.; breadth 5–11 cm.; petiole 5 mm.–1 cm. long, glabrous, verrucose in dried material. *Flowers* fragrant, 1–4, terminal and opposite the leaves with 2 minute bracts at base of pedicel and one obtuse amplexicaul one near base of calyx. *Pedicels* 1 cm. long, thickened from below upwards, seated on a short peduncular axis. *Sepals* glabrous or minutely puberulous, 7 mm. long, oblong, obtuse, thick with membranous edges, adpressed to the petals. *Petals* glabrous or minutely puberulous outside, spreading, the edges very thick especially near apex, acute; outer, 1·8–2 cm. long, elliptic with a broad base, greenish outside, white inside; inner 1·5 cm. long, white with narrow claw and rhomboid blade. *Stamens* numerous, 4 mm. long, spathulate, filaments 1 mm. long, connectives produced, obtuse, bent outwards slightly; an inner whorl of narrow staminodes 6 mm. long next the carpels and bent over them. *Ovaries* 8–9, angled, 3 mm. long; stigma cone-shaped

with U-shaped opening on top and groove on the inner side. *Ripe carpels* 4–8 clavate follicles, gradually narrowed into a stalk, total length 2·5–3 cm., dehiscing. *Seeds* 2, black, shining, lying side by side, concave-convex, compressed with hilum at pointed end. **Fig. 24.**

Herbarium specimens from all provinces in Malaya except Perlis and Penang. In Singapore recorded only from the Botanic Gardens' Jungle.

DISTRIBUTION: Borneo and Java.

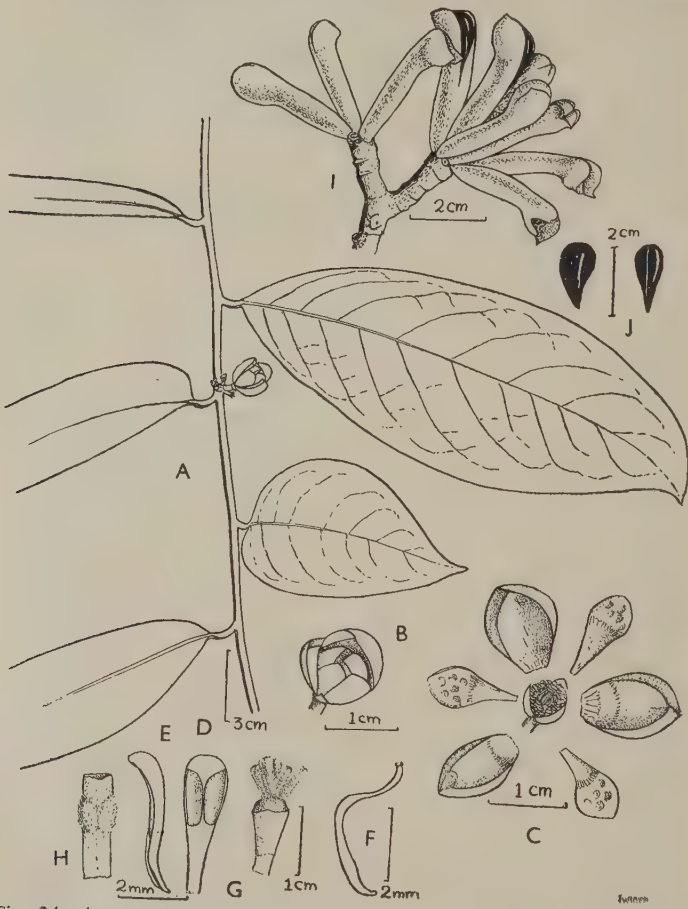


Fig. 24. *Anaxagorea javanica* Bl.

A, Flowering twig. B, Flower bud, opening. C, Flower. D, Stamen, front view. E, Stamen, side view. F, Staminode. G, Torus with ovaries. H, Single ovary. I, Ripe fruit. J, Seeds.

var. **tripetala** Corner in Gard. Bull. Str. Settl. 10 (1939) 12.

Inner petals absent.

KEDAH: Gunong Jerai, *Meh 9043* (K., Kew).

PERAK: Gunong Pondok, *Henderson S.F.N. 32788* (S., Kew) type; Larut, *King 2375* (C., D.D.); Upper Perak, *Wray 3400* (S., Kew); Sungei Siput, *Haniff* and *Nur S.F.N. 6951* (S., K.); Kuala Kenering, *Ridley 14734* (S., C., Kew); Bubu, Ulu Kangsar, *Symington 40789* (K.); Piah F.R., *Ja'amat* and *Tachun 39365* (K.); Kledang, *Symington 25822* (K.).

TRENGGANU: Belara F.R., 23rd mile Trengganu-Besut Road, *Sinclair S.F.N. 39928* (S.).

SELANGOR: Semenyih, *Hume F.M.S. Museums Herb. 8390* (S.).

DISTRIBUTION: Siam, Borneo.

var. **dipetala** Corner in Gard. Bull. Str. Settl. 10 (1939) 12.

Sepals 2. Petals 2.

JOHORE: Sungei Berassau, Mawai-Jemaluang Road, *Corner S.F.N. 28972* (S., K., Kew) type; S. Kayu Ara, *Corner S.F.N. 29464* (S., K., Kew); 14th mile Mawai-Jemaluang Road, *Corner 9th February, 1935* (S.); 15th mile Mawai-Jemaluang Road, *Corner S.F.N. 31932* (S., Kew).

No records as yet outside Johore.

22. FISSISTIGMA Griffith, Notul. 4 (1854) 706.

Synonym: Melodorum Hk. f. et Th. et Auct. non Lour.

The species included here are those of Melodorum section Eumelodorum Hk. f. et Th. Fl. Ind. 1 (1855) 115 but excluding Pyramidanthe prismatica (Melodorum prismaticum).

Climbers. Leaves, pedicels, flowers and carpels usually pubescent or tomentose, sometimes copiously so. Secondary veins of leaf absent; reticulations when visible scalariform, at right angles to the nerves. *Flowers* terminal in cymes or in branched panicles opposite the leaves but sometimes a part of the inflorescence appearing axillary due to branching low down between the main axis and the leaf. *Sepals* 3, valvate, united at the very base. *Petals* valvate in two series, coriaceous and with thickened edges, usually elongated, lanceolate but sometimes ovate or oblong; the outer erect or spreading, flat; the inner slightly shorter, triquetrous and concave at base inside. *Stamens* numerous, connectives slightly produced, oblique, obtuse or slightly apiculate. *Ovaries* pubescent, slightly curved, grooved on inner side; style present, sometimes narrowly clavate at the stigmatic tip but usually not enlarging, the stigmatic portion being very short and not differentiated clearly

from the style. *Carpels* usually large, 2 cm. or more in diam.; spherical, ovoid or oblong, thick-walled; stalked (nearly sessile in *F. lanuginosum*). *Seeds* several in 2 rows, smooth, shining.

TYPE OF GENUS: *Fissistigma scandens* Griff., Notul. 4 (1854) 706.
DISTRIBUTION: Africa, East India to South Yunan, Malay Islands to North-East Australia. The genus is absent from Ceylon. Species over fifty.

I have excluded from *Fissistigma* and retained as distinct genera *Pyramidanthe* Miq. and *Mitrella* Miq. (See notes under these genera). The species remaining in *Fissistigma* (i.e. section *Eumelodorum* Hk. f. et Th. of *Melodorum*) then form a very natural and uniform series. Merrill in the Phil. Journ. of Science Bot. 15 (1919) 125–130 gives very good reasons why the name *Fissistigma* Griff. should be used for the Malayan species enumerated here and for certain others not in Malaya and how *Melodorum* Loureiro has nothing to do with them. He however includes *Mitrella* and *Pyramidanthe* in *Fissistigma.*

He has after his researches retained *Melodorum* of Loureiro as a distinct genus since he found that the type of that genus is the plant which is usually called *Sphaerocoryne aberrans* (Maingay ex Hk. f. et Th.) Ridley and which Loureiro called *Melodorum fruticosum* Lour. Dunal added subsequent species to the genus *Melodorum,* the first of these being *Melodorum latifolium* (Dunal) Hk. f. et Th. He however regarded *Melodorum* as a section of *Unona.* Hooker fil. and Thomson then considered this section as a genus namely *Melodorum.* They admit that Loureiro's *Melodorum fruticosum* was different from *M. latifolium* and their other species and excluded it from *Melodorum.* Subsequent authors have been content to follow them and Loureiro's original conception of the genus seems to have been forgotten. The name *Fissistigma* is available for the subsequent species and excludes Loureiro's two species *Melodorum fruticosum* and *arboreum.* (There is no specimen preserved of the latter).

The most probable affinity is with *Xylopia* (see notes under *Xylopia* and *Mitrella*). There are however a good many points of difference.

KEY

a. Leaves whitish or glaucous beneath; reticulations on under-surface not visible or extremely faint

b. Rusty-pubescence present on midrib and nerves beneath

(1) **F. litseaefolium**

b. Rusty-pubescence not present on midrib and nerves beneath (2) **F. hypoglaucum**

a. Leaves not whitish or glaucous beneath

c. Reticulations of lower surface very faint or invisible, hidden by tomentum

d. Tomentum or pubescence very short, adpressed, golden, shining beneath; outer petals 1·2–1·5 cm. long; carpel stalks 1·8 cm. long (3) **F. fulgens**

d. Tomentum thick, shining, adpressed; outer petals 2–2·3 cm. long; carpel stalks 1·5–7·5 cm. long (4) **F. manubriatum**

c. Reticulations of lower surface very distinct

e. Sepals 1–1·5 cm. long; carpel stalks 5 mm. long or subsessile; tomentum of leaves very copious, rufous-lanate, not shining (5) **F. lanuginosum**

e. Sepals 2–3 mm. long; carpel stalks more than 5 mm. long; tomentum of leaves copious or not but never lanate

f. Tomentum dark chocolate-coloured; outer petals 1·5–2 cm. long; carpels spherical (6) **F. Kingii**

f. Tomentum copious, rusty or brown, not chocolate-coloured; leaves coriaceous; outer petals 1–1·2 cm. long, carpels thick-walled, 3–4 mm. thick

g. Carpels spherical (with harsh, erect, rusty-brown tomentum) (7) **F. latifolium**

g. Carpels ovoid, slightly verrucose, minutely brown-tomentose var. **ovoideum**

f. Tomentum not copious, sparsely pubescent only; leaves thinly coriaceous; outer petals 3·5 cm. long; carpels smooth, thin-walled, not over 1 mm. thick (8) **F. rubiginosum**

(1) **F. litseaefolium** (King) Merr. in Philipp. Journ. Sc. 15 (1919) 133.

Basonym: Melodorum litseaefolium King, Mat. F.M.P. Vol. 1 No. 4 (1892) 352 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 132 Pl. 173; Ridley, F.M.P. 1 (1922) 83.

Climber. *Young twigs* minutely rusty-tomentose, afterwards glabrous and rough with numerous lenticels as in *F. hypoglaucum*. *Leaves* as in *F. hypoglaucum* but midrib and nerves beneath rusty-pubescent. *Flowers* in terminal, few-flowered panicles opposite a leaf. *Pedicels* 7–9 mm. long, rufous-tomentose with a single, small,

median bracteole. *Sepals* broadly ovate, acute, united at the base, rusty-tomentose outside, 2 mm. long. *Petals* broadly ovate-oblong, acute, coriaceous; outer 5–8 mm. long, slightly concave and glabrous at the base inside, rusty-tomentose outside; inner shorter, puberulous except the glabrous pitted concavity at base inside. *Stamens* numerous, connectives broad, produced and bluntly triangular. *Ovaries* few, oblong, oblique, rusty-pubescent, 4-ovuled. *Ripe carpels* unknown.

PERAK: Larut, *King Nos. 4986* (S., C.) type material; *4063* (C., Kew) type material.

TRENGGANU: 38th mile Trengganu-Besut Road, west side, *Sinclair S.F.N. 39950* (S.).

DISTRIBUTION: Not known from elsewhere.

This species differs from *F. hypoglaucum* in having the midrib and veins of the lower surface of the leaf covered with a rusty-pubescence.

(2) **F. hypoglaucum** (Miq.) Merr. in Philipp. Journ. Sc. 15 (1919) 130.

Basonym: Melodorum hypoglaucum Miq. in Ann. Mus. Bot. Lugd.-Bat. 2 (1865) 36; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 355 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 136 Pl. 180A; Ridley, F.M.P. 1 (1922) 86.

Large creeper with main stem 15–20 cm. in diam. *Youngest twigs* slender, minutely rusty-tomentose, soon glabrous and rough with numerous lenticels, brownish. *Leaves* thinly coriaceous, glabrous above except the midrib, minutely puberulous or glabrous below, dull, medium green above, glaucous beneath, elliptic-oblong, acute, base sub-acute or rounded, edges very slightly revolute; nerves 10–12 pairs, oblique, running out to edge, visible above, prominent below; reticulations faint on both surfaces; length 6–11 cm.; breadth 3·5–4 cm.; petiole 5–8 mm. long, rusty-pubescent. *Inflorescence* a terminal panicle, opposite a leaf, cymosely branched, rusty-pubescent. *Pedicels* 1–1·5 cm. long with 2 bracts about 1·5 mm. long, one at base of pedicel and the other mid-way or at base of flower. *Sepals* 2 mm. long, ovate, acute, rusty-pubescent outside, slightly less so inside, free except at the very base. *Petals* coriaceous, linear-lanceolate, obtuse, broad and concave at the base and for some distance upwards, the tips triquetrous, rusty-tomentose outside and slightly less so inside, the outer 1–1·2 cm. long and 5 mm. broad at base, the inner 8 mm. long and 2·5 mm. broad at base. *Stamens* 1 mm. long, the connectives slightly produced, oblique and rather broad. *Ovaries* 2 mm. long, pubescent, elongated, straight on the inner and curved

on the outer side, gradually narrowed into the style, the stigmatic tip of which is slightly bent outwards. *Torus* conical. *Ripe carpels* globose to ovoid, tubercled, rusty-pubescent to glabrescent, 2 cm. in diam. with stalks 3–3·5 cm. long. *Seeds* 4–5, oval, compressed, smooth, brown, shining, in 2 rows.

PERAK: *Scortechini 1970* (C.); Gopeng, Kinta, *King 4465* (C., D.D.); Larut, *King 5060* (C.); *4199* (C.); Gopeng, Larut, *King 5806* (S., C., D.D., Kew); Ulu Bubong, *King 10522* (S., C., E.); *King 7924* (C., Kew).

DISTRIBUTION: Sumatra.

See notes under *F. litseaefolium.*

(3) **F. fulgens** (Hk. f. et Th.) Merr. in Philipp. Journ. Sc. 15 (1919) 130.

Basonym: Melodorum fulgens Hk. f. et Th. Fl. Ind. 1 (1855) 120 et in Fl. Br. Ind. 1 (1872) 82; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 353 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 132 Pl. 174; Ridley in Sarawak Mus. Journ. 1/3 (1913) 90; F.M.P. 1 (1922) 83.

Synonyms: Uvaria fulgens Wall. Cat. 6482 *nomen nudum. Myristica Finlaysoniana* Wall. Cat. 6793 *nomen nudum.*

Large climber. *Young twigs* minutely tawny-pubescent, terete, soon glabrous, dark-coloured and striate. *Leaves* thinly coriaceous, oblong-lanceolate, acute, sometimes acuminate, base rounded or slightly acute, upper surface glabrous except midrib, dark green, dull, lower paler, minutely scaly with orange-brown pubescent midrib and veins; veins 13–18 pairs, oblique, running out to edge, faint above, prominent beneath, reticulations very faint or not visible; length 7·5–15 cm.; breadth 3–5 cm.; petiole 7–10 mm. long, orange, pubescent. *Flowers* with a faint sweet odour, terminal in few-flowered cymes opposite the leaves. *Pedicels* 5–10 mm. long, thickening towards base of flower, adpressed-tawny-pubescent, with a linear-lanceolate acute bract at base and a median, broadly ovate, acute bract. *Sepals* broadly ovate, subacute, united at the very base, tawny-pubescent outside, glabrous inside, 1–2 mm. long. *Petals* thick, orange, the outer ovate-oblong, acute, pubescent outside, glabrous at the base inside, 1·2–1·5 cm. long, erect at first, then spreading and finally recurving when the inner drop off; inner concave at base, warted slightly, glabrous except near apex outside, 7 mm. long. *Stamens* numerous, dark red, 2 mm. long, connectives produced and pointed, nearly as long as the fertile part, filaments very short. *Ovaries* elongate, 3 mm. long, pubescent, brownish, passing gradually into the pointed style, stigma not distinct from style. *Ripe carpels* 3–4 cm. long and 2·3

cm. in diam., globose to oblong, obtuse, walls hard, stony, 7 mm. thick, surface minutely shining, tawny-tomentose as are the 1·8 cm. long stalks. *Seeds* several in two rows, oblong, brown, shining. **Fig. 25.**

KELANTAN: Kuala Krai, *Haniff* and *Nur S.F.N. 10098* (S., K.).

PERAK: *Scortechini 1123* (S., C.); *1549* (C.); Larut, *Scortechini 1671* (C.); *King 7048* and *6201* (C., D.D.); *Nos. 2654* (K., Kew); *782* (C.); *5453* (C., Kew); Gopeng, Kinta, *King 4583* (C.); Tupai, *Wray 2441* (S., C.); Matang, *Wray 2715* (S., C.); Taiping, *Wray 2093* (S., C.); Kati, Kuala Kangsar, *Haniff S.F.N. 14955* (S.); Tapah, *Wray 1331* (Kew).

TRENGGANU: Ulu Bendong, Kajang, Kemaman, *Corner S.F.N. 30146* (S., Kew).

PAHANG: Temerloh near Rest House, *Hashim C.F. 692* (S., K.); Raub, *Burkill* and *Haniff S.F.N. 16875* (S., K.).

SELANGOR: Ginting Simpah, *Hume F.M.S. Mus. Herb. 9822* (S.); 22nd mile Ginting Simpah, *Strugnell 13002* (S., K.); Bukit Kutu, *Goodenough 10608* (S., Kew); Garawang, Kuala Lumpur, *Mahamot 2116* (S., C.); below Gap, Semengko, *Curtis 3756* (S., Kew).

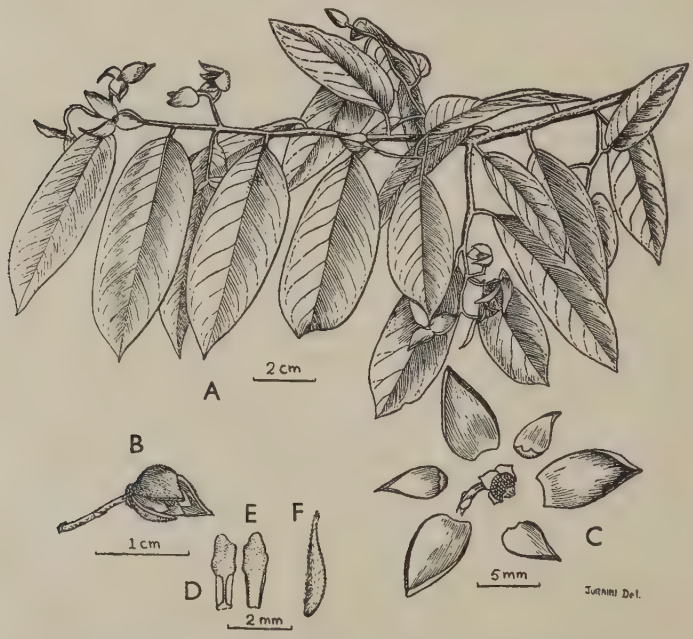


Fig. 25. *Fissistigma fulgens* (Hk. f. et Th.) Merr.

A, Flowering twig. B, Flower. C, Flower with petals detached. D, Stamen, front view. E, Stamen, back view. F, Gynoecium.

MALACCA: *Griffith* (C., Kew) type material; *Maingay 73* (C., Kew); Bukit Kupayang, *Alvins 2153* (S.); Bukit Tumiyeing, *Alvins 2225* (S.); Merlimau, *J.W.* and *M., June 1886* (S.); Sungei Udang, *Derry 520* (S., Kew).

JOHORE: *Nongchie 4417* (S., C.); Mount Austin, *Ridley, date 1890* (S.); Mawai, *Corner, 21st May, 1934* (S.).

SINGAPORE: *Anderson 5* (C., E.); Sungei Loyang, *Ridley, no no. or date* (S.); Bukit Timah, *Ridley 2115* (S.); *Hullett 575* and *895* (S., C.); Bukit Mandai, *Ridley 3641a* (S., C.); *Goodenough, 14th April, 1890* (S.); Toa Payoh, *Ridley 1823* (S., C., Kew); Sungei Tengeh, *Goodenough 3905* (S.); Chan Chu Kang, *Goodenough 5079* (S.).

DISTRIBUTION: Sarawak, Borneo, Sumatra, Philippines. Seems to be absent from Siam and North Malaya.

A common species in the South of Malaya. Easily recognized by the shining leaves with minute, adpressed, tawny-pubescence on the lower surface. Many sheets of *F. fulgens* in the Singapore Herbarium have been wrongly labelled *Melodorum cylindricum*. I have seen *Maingay 78* in Herb. Calcutta and Kew, the type of *Melodorum cylindricum*. It is a synonym of *Fissistigma prismaticum* (Hk. f. et Th.) Merr. which I call *Pyramidanthe prismatica*.

(4) **F. manubriatum** (Hk. f. et Th.) Merr. in Philipp. Journ. Sc. 15 (1919) 134.

Basonym: Melodorum manubriatum Hk. f. et Th. Fl. Ind. 1 (1855) 118 et in Fl. Br. Ind. 1 (1872) 79; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 353 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 134 Pl. 176; Boerl. in Icon. Bog. 1 Fasc. 2 (1899) 132 Tab. 43E, Fig. 1; Ridley in Sarawak Mus. Journ. 1/3 (1913) 88; Merr. in Journ. Roy. As. Soc. Str. Br. (1921) 262; Ridley, F.M.P. 1 (1922) 84.

Synonyms: Uvaria manubriatum Wall. Cat. 6456 *nomen nudum. Melodorum bancanum* Scheff. Nat. Tijds. 31 (1870) 343. et in Flora 53 (1870) 244. *M. Korthalsii* Miq. in Ann. Mus. Bat. Lugd.-Bat. 2 (1865) 37.

Stout climber up to 30 m. or over. *Young twigs* rusty-tomentose, tardily becoming glabrous, striate, dark coloured and with numerous lenticels. *Leaves* thinly coriaceous, dark green above, often greyish when dry, beautiful golden, shining, adpressed-tomentose beneath, the tomentum becoming dark brown or blackish in older leaves and often less in quantity, oblong-lanceolate, acute or acuminate, base rounded; nerves 12–18 pairs, oblique, running out to edge, faint above, prominent beneath; reticulations obscured by the tomentum; length 5–13·5 cm.; breadth 2–4·5 cm.; petiole 7 mm. long, rusty-pubescent. *Flowers* with a faint melon odour, terminal, 1–3, opposite a leaf. *Pedicels* 1 cm. long, rusty-tomentose, slightly thickened at base of flower, bearing 2 bracts, one caducous, basal,

and one median. *Sepals* ovate-lanceolate, acute, faintly 3-nerved, softly tawny-tomentose outside, glabrous inside, united at the base, 7 mm. long. *Petals* coriaceous, ovate-lanceolate, acute, thickened at the edges; outer 2–2·3 cm. long and 1 cm. broad at base, tawny-tomentose outside with hairs 1 mm. long, puberulous inside and glabrous at the base; inner slightly smaller, red when young, greyish when older, falling before the outer, concave at base and glabrous except at the tips. *Stamens* 2 mm. long, red, the connectives produced, oblique and obtuse. *Ovaries* 3 mm. long, elongate, angled, covered with long erect hairs, stigma sessile, minutely notched. *Ripe carpels* numerous, ovoid-globose, rusty-tomentose like the stalks, 2·5–3 cm. long; stalks 1·5–7·5 cm. long. *Seeds* about 8 in 2 rows. **Fig. 26.**

DISTRIBUTION: Herbarium specimens from all the Malayan states except Perlis, Kelantan, Province Wellesley and Trengganu. It is however likely to occur in some of these. It is also found in Sarawak, Dutch Borneo and Bangka. Type is in Kew *Wall. Cat. 6456* Porter, Penang.

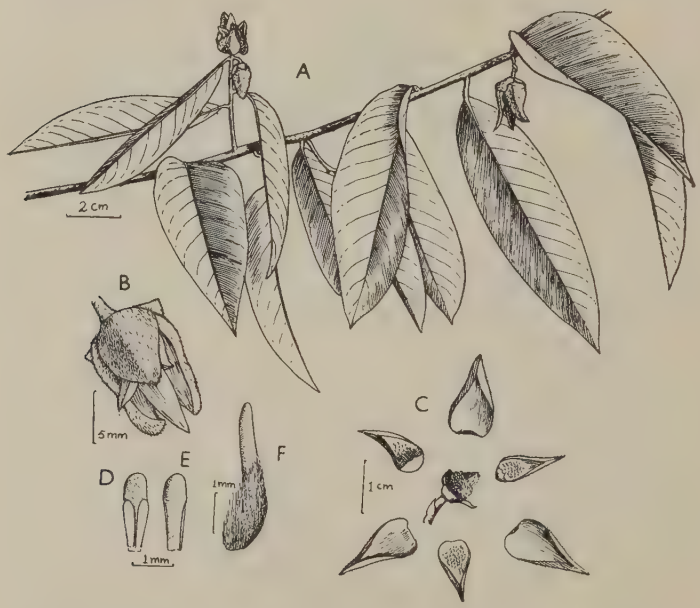


Fig. 26. *Fissistigma manubriatum* (Hk. f. et Th.) Merr.
A, Flowering twig. B, Flower. C, Flower with petals detached. D, Stamen, front view. E, Stamen, side view. F, Gynoecium.

This species resembles the Assam-Burma species *F. bicolor* but the carpels stalks are much longer, not 5 mm. long to sessile, the petals not so broad and the leaves more tomentose beneath than in *F. bicolor*. It recalls the Malayan species *F. lanuginosum* but *F. lanuginosum* has much longer petals, shorter carpel-stalks and the reticulations are visible on the lower surface of the leaf whereas they are obscured by tomentum in *F. manubriatum*.

(5) **F. lanuginosum** (Hk. f. et Th.) Merr. in Philipp. Journ. Sc. 15 (1919) 132.

Basonym: Melodorum lanuginosum Hk. f. et Th. Fl. Ind. (1855) 117 et in Fl. Br. Ind. 1 (1872) 79; Miq. Fl. Ind. Bat. 1 Part 1 (1858) 35; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 357 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 138 Pl. 182; Ridley, F.M.P. 1 (1922) 86.

Synonym: Uvaria tomentosa Wall. Cat. 6454 *nomen nudum*.

Climber. *Young twigs* rusty-tomentose, tardily becoming glabrous and with numerous lenticels. *Leaves* coriaceous, dark green and glossy above, often drying a silvery-grey, oblong or obovate-oblong, acute or less often slightly acuminate, base rounded, edges and midrib above rusty-pubescent, entire lower surface densely rufous-lanate but not shining as in *F. manubriatum;* nerves 12–22 pairs, oblique, interarching close to edge, faint above, prominent beneath; reticulations forming a close network beneath, very faint above; 9–21 cm. long and 4–8 cm. broad; petiole 1–1·5 cm. long, stout, tomentose. *Flowers* 1–4 in cymes, terminal and opposite to a leaf. *Pedicels* stout, 1 cm. long, rufous-lanate with 2 amplexicaul, acute, lanate bracts. *Sepals* 1–1·5 cm. long, very similar to those of *F. manubriatum* but of larger dimensions, rufous-lanate like the outer petals. *Petals* coriaceous, oblong-lanceolate, sub-acute, also like those of *F. manubriatum;* outer 3–3·5 cm. long, thickened at the edges; inner slightly smaller, glabrous or glabrescent, pink, concave at the base and triquetrous above. *Stamens* numerous, 2 mm. long, connectives oblique, produced. *Ovaries* 3 mm. long, slightly obovoid, curved on the outer side, densely hairy as in *F. manubriatum* but styles longer, up to 1 mm., glabrous. *Ripe carpels* sub-globose, slightly narrowed to the base, 2 cm. in diam., densely clustered, sub-sessile or with stalks 5 mm. long. *Seeds* 4–6 in 2 rows, shining, dark brown.

DISTRIBUTION: Specimens from all states in Malaya except Perlis, Kelantan, and Province Wellesley. Common in Perak. Also found in Indo-China. Type is in Kew *Wall. Cat. 6454 Porter,* Penang.

A close relative of *F. manubriatum* (see notes under that species) but a more handsome plant. Tomentum more in quantity but that on the underside of the leaves not shining as in *F. manubriatum.*

(6) **F. Kingii** (Boerl.) Burkill in Kew Bull. (1935) 317 et Dict. Prod. Mal. Penins. 1 (1935) 1021.

Basonym: Melodorum Kingii Boerl. in Icon. Bogor. 1 (1899) 134; Ridley, F.M.P. 1 (1922) 85; Airy-Shaw in Kew Bull. (1939) 287.

Synonym: M. parviflorum sensu King, Mat. F.M.P. Vol. 1 No. 4 (1892) 356 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 137 Pl. 181 non Scheff.

Climber. *Young twigs* dark chocolate-brown-tomentose, later glabrous, striate and with numerous lenticels. *Leaves* coriaceous. glossy, upper surface drying yellowish green, elliptic, acute, base rounded, glabrous above except sometimes for the sunk midrib. lower surface shortly dark chocolate-tomentose, becoming less tomentose or occasionally glabrous with age; nerves 11–15 pairs. oblique, nearly parallel, faint above, raised below, interarching near the edge; reticulations not visible above, prominent and scalariform beneath; length 7–12 cm.; breadth 3·5–5·5 cm.; petiole 1 cm. long, tomentose. *Inflorescence* opposite a leaf, terminal, branched, cymose, dark chocolate-tomentose (often branched at base so that one branch may appear axillary). *Pedicels* 8 mm.–1·3 cm. long with one minute, basal and one medial bract. *Sepals* 2–3 mm. long, triangular, acute, united at the very base, tomentose outside, glabrous inside, the tomentum the same colour as that of the leaves, pedicels, petals and ripe carpels. *Flower buds* triquetrous. *Outer petals* 1·5–2 cm. long, oblong-lanceolate, coriaceous. acute, concave inside; inner slightly smaller, triquetrous, less tomentose and glabrous at the base inside. *Stamens* 1–1·3 mm. long, connectives oblique and obtuse. *Ovaries* 2 mm. long, elongate, curved, densely tomentose; style elongate, narrowly clavate at the stigmatic tip, grooved. *Ripe carpels* spherical, rough or slightly verrucose, 2·5–3 cm. in diam.; stalks stout, 3–3·5 cm. long. *Seeds* dark brown, shining, in 2 rows.

PERAK: Larut, *King 5344* (S., C., E., Kew); *4070* (C., Kew) and *7276* (C.); Waterfall, *Wray 1965* (S., C.); Sungei Larut, *Wray 3064* (S., C.); Taiping, *King 8366* (C., E.) and *8375* (C., D.D.); Ulu Bubong, *King 10275* (Kew).
PAHANG: Tembeling, *Henderson S.F.N. 21802* (S., C., Kew).
SELANGOR: Kampong Kerling, *Goodenough 10th October, 1899* (S.).
MALACCA: Selandor, *Alvins 609* (S.); Ayer Panas, *Derry 496* (S.).
JOHORE: Sungei Kayu, *Kiah S.F.N. 32197* (S., C., Kew).
DISTRIBUTION: Borneo, Sarawak and Bangka.

Airy-Shaw, Kew Bull. (1939) 287, describes several varieties none of which has yet been found in Malaya. This species has angled, triquetrous flower buds as in *F. hypoglaucum* but they are larger in *F. Kingii*. It is at once distinguished from *F. hypoglaucum* which has the leaves glaucous beneath without the distinct scalariform reticulations. From *F. latifolium* it is distinguished by the sparser, dark chocolate-brown tomentum which is present on the undersurface of the leaves, pedicels, flowers and carpels.

(7) **F. latifolium** (Dunal) Merr. in Philipp. Journ. Sc. 15 (1919) 132.

Basonym: Unona latifolia Dunal, Monog. Anon. (1817) 115.

Synonyms: Uvaria longifolia Bl. Bijdr. (1825) 13. *U. latifolia* Bl. Fl. Jav. Anon. (1830) 37 T. 15. *Melodorum mollissimum* Miq. Fl. Ind. Bat. Suppl. (1861) 374. *M. latifolium* Hk. f. et Th. Fl. Ind. 1 (1855) 117 et in Fl. Br. Ind. 1 (1872) 79; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 354 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 135 Pl. 178 and 179; Ridley, F.M.P. 1 (1922) 85.

Typical form

Leaves softly pubescent above, tomentose beneath; nerves 18–20 pairs, very oblique, the reticulations on the lower side not very well marked. *Carpels* spherical.

PERAK: Kinta, *King 7053* (Kew); Gopeng, *King 8230* (S.); Maxwell's Hill, Wray *3224* (S.).

These sheets are the nearest to typical *Fissistigma latifolium*. The carpels are spherical and both they and their stalks are covered with short reddish, rather harsh tomentum. Unfortunately neither the type sheet of *Uvaria latifolia* nor any of the Java sheets in the Kew Herbarium have ripe fruit. The common form of *latifolium* in Malaya is the var. *ovoideum* and there should be no difficulty in recognizing it. Merrill raises it to specific rank but this seems hardly justifiable.

var. **ovoideum** (King) J. Sinclair, **comb. nov.**

Basonym: Melodorum latifolium var. *ovoideum* King, Mat. F.M.P. Vol. 1 No. 4 (1892) 355 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 135 Pl. 179.

Synonym: Fissistigma ovoideum (King) Merr. in Philipp. Journ. Sc. 15 (1919) 134.

Large climber. *Young twigs* rusty-tomentose, tardily becoming glabrous and dark coloured. *Leaves* coriaceous, dark green and dull above, oblong or oblong-lanceolate, apex rounded and slightly

acute, base rounded, slightly pubescent above on the midrib and nerves, softly and minutely brown-tomentose beneath; nerves 16–22 pairs, oblique, nearly parallel, fine and sunk above, prominent beneath, interarching near edge; reticulations faint above, prominent and scalariform beneath, forming a close network; length 8–19 cm.; breadth 4–6·5 cm.; petiole 1–1·5 cm. long, tomentose, *Inflorescence* terminal, branched, racemose-cymose, opposite the leaves. *Pedicels* about 1 cm. long, brown-tomentose with 2 minute, 1–2 mm. long, lanceolate, acute bracts, one basal and one sub-median. *Sepals* 3 mm. long, ovate-triangular, acute, brown-tomentose on the outside like the petals, glabrous inside, united at the base. *Petals* coriaceous, ovate-lanceolate, acute, concave inside resembling those of *F. fulgens* but larger; outer 1–1·2 cm. long, spreading, inner glabrous, slightly smaller, falling before the outer. *Stamens* 1·5–2 mm. long, the connectives produced, triangular, acute. *Ovaries* 2–2·5 mm. long, densely hairy with erect hairs, slightly curved, oblong; style short and stigmatic part not enlarged or differentiated from it. *Ripe carpels* oblong, obtuse or slightly apiculate, densely and minutely brown-tomentose, often slightly verrucose, thick-walled, 3·5–4·8 cm. long and 2·5–3 cm. in diam.; stalks stout, tomentose, 3–4 cm. long. *Seeds* 4–6 in 2 rows, dark brown, shining.

DISTRIBUTION: Very common in Perak and Singapore. I have not seen specimens from Perlis, Province Wellesley, Kedah, Kelantan or Pahang but it doubtless occurs in some of these. It is found in Siam and Indo-China. Other forms of *F. latifolium* are found in Java, Borneo and the Philippines.

Fissistigma latifolium is a very variable species and has a wide distribution. *Melodorum mollissimum* Miq. from Sumatra, legit Teysmann, is similar to Blume's *Uvaria latifolia* but I hardly think *Melodorum* (*Uvaria*) *sphaerocarpa* can be included here. It is certainly a *Fissistigma* with spherical, nearly glabrous carpels but the material on the type sheet in Kew is too scanty and inadequate to come to a definite conclusion.

The Sarawak material of *latifolium* is distinct in having the under surface of the leaf markedly reticulate with soft reddish tomentum and verrucose spherical carpels.

The North Bornean form from Sandakan and Tawao is also very reticulate but there are more nerves on the leaf, up to 20 as against 13–15 and the tomentum is yellowish-brown not reddish. The carpels are also spherical.

Ridley's *Fissistigma breviflorum* from Sumatra might very well rank as another variety of *F. latifolium*. The leaves are densely reticulate beneath but the tomentum on the leaves and flowers is yellow. The petals are shorter than in the type and other forms and the carpels are spherical.

There is also a narrow leaved form from Mount Kinabalu. Whether these are subspecies or varieties is a difficult question and a chromosome analysis may help to solve the problem.

(8) **F. rubiginosum** (A. DC.) Merrill in Philipp. Journ. Sc. 15 (1919) 135.

Basonym: Uvaria rubiginosa A. DC. in Mém. Soc. Phys. Genève 5 (1832) 202.

Synonyms: Uvaria nervosa Wall. Cat. (1832) No. 6479 *nomen nudum. Uvaria fulva* Wall. Cat. 6427 *nomen nudum. Melodorum rubiginosum* Hk. f. et Th. Fl. Ind. (1855) 116 et in Fl. Br. Ind. 1 (1872) 79; King in Ann. Roy. Bot. Gard. Calc. 4 (1893) 138 Pl. 183 (including *var. oblonga*); Ridley, F.M.P. 1 (1922) 88: Craib. Fl. Siam. Enum. (1925) 57.

Climber. *Young twigs* rusty-pubescent, later glabrous, striate. dark coloured. *Leaves* thinly coriaceous or almost membranous. oblong to elliptic, obtuse, minutely cuspidate or acute, rounded or sub-cordate at the base, glabrous above except for the sunk midrib. lower surface pubescent or sparsely pubescent, the degree of pubescence varying; nerves 13–19, usually about 16 pairs, oblique and nearly parallel, sunk above, raised beneath, prominent, interarching near margin; length 13–22 cm.; breadth 4–9 cm.; petiole 9 mm.–1·4 cm. long, stout, tomentose. *Flowers* terminal, opposite the leaves. solitary or in 3-5-flowered cymes. *Pedicels* brown-pubescent, 2 cm. long with a minute basal and a submedian bract. *Flower buds* elongate, terete, tapering from a bulbous base. *Sepals* 2–3 mm. long. broadly triangular, acute, tomentose outside, glabrous inside, united at the base. *Petals* coriaceous, acute; outer 3·5 cm. long when mature, elongate-lanceolate, spreading or reflexed, brownish-tomentose outside, pale pink and glabrous inside; inner slightly shorter, pale pink, triquetrous, concave, glabrous and yellow at the base inside. *Stamens* 2·5 mm. long, pink, connectives produced, oblique and apiculate. *Ovaries* 3 mm. long, pubescent with erect hairs, slightly falcate; style elongate, obtuse at the stigmatic portion, grooved. *Ripe carpels* oblong, obtuse, brown-pubescent, thin-walled, 2·5–3 cm. long with stalks 1·2–2 cm. long. *Seeds* several in 2 rows, dark brown, shining.

KEDAH: Langkawi, *Curtis 2523* and *2524* (S., C.); Tan, *Ridley 5366* (S., C.).

PENANG: Edge of Waterfall Gardens, *Burkill S.F.N. 1227* (S.); *Sinclair S.F.N. 39030* (S., E., Kew); *Nur S.F.N. 1365* (S., Kew); *King 5082* (C.); *Curtis 843* (Kew).

PROVINCE WELLESLEY: Kubu Gardens, *Ridley 7018* (S.); Tasek Glugor, *Burkill S.F.N. 6549* (S.); Bukit Juru, *Ridley, December 1895* (S.).

PERAK: Road to Batu Kurau, *Curtis 843* (S., C.); Gopeng, Kinta, *King 4496* (S., C.) and *5837* (C., Kew).

PAHANG: Pekan, *Burkill* and *Haniff S.F.N. 17295* (S.).

DISTRIBUTION: Sylhet to Chittagong, Tenasserim, Siam, Indo-China, Borneo and Sumatra.

This species slightly resembles *F. latifolium* but has thinner leaves which are never thickly tomentose as in *F. latifolium*. The petals are longer in *F. rubiginosum* and the carpels are smooth and have much thinner walls. Other Malayan species in section *Eumelodorum* have thick-walled carpels.

23. PYRAMIDANTHE Miq. in Ann. Mus. Bot. Lugd.-Bat. 2 (1865) 39; Boerl. in Icon. Bog. 1 (1899) 130 T. 43 f, D. usually included in *Fissistigma* (Melodorum) section *Pyramidanthe* Kurz.

Climber. *Leaves* coriaceous with secondary veins; reticulations rather loose, not scalariform. *Flowers* axillary. *Sepals* 3, valvate, united in a flat collar-like disc. *Petals* 6, valvate, the outer triquetrous, much longer than the inner. *Stamens* as in *Fissistigma*, the connectives slightly shorter. *Ovaries* 5–6 with a capitate, minutely multi-lobed stigma. *Seeds* several in 2 rows, smooth.

TYPE OF GENUS: *P. rufa* Miq. (1865) which is a synonym of *P. prismatica* (Hk. f. et Th.) J. Sinclair.

DISTRIBUTION: Siam, Malaya, Borneo and Sumatra. One species.

Other species included in *Fissistigma* section *Pyramidanthe* by Kurz, King and Ridley do not belong here but should go in the section *Eumelodorum* of *Fissistigma*. (i.e. if the three sections of *Fissistigma* are to be maintained). *F. macranthum* (Kurz.) Merr. in Phil. Journ. Sc. Bot. 15 (1919) 133, *synonym: Melodorum macranthum* Kurz is a *Goniothalamus, G. macranthus* (Kurz) Boerl.

P. prismatica (Hk. f. et Th.) J. Sinclair, **comb. nov.**

Basonym: Melodorum prismaticum Hk. f. et Th. Fl. Ind. 1 (1855) 121 et in Fl. Br. Ind. 1 (1872) 81; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 358 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 140 Pl. 185; Ridley, F.M.P. 1 (1922) 87; Craib, Fl. Siam. Enum. 1 (1925) 57.

Synonyms: M. Maingayi Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 80; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 358 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 139 Pl. 184A. *M. cylindricum* in Hk. f. et Th. Fl. Br. Ind. 1 (1872) 80. ? *M. rigidum* Ridley in Kew Bull. (1912) 386. *Uvaria rufa* Wall. Cat. 6455 *nomen nudum. Pyramidanthe rufa* Miq. in Ann. Mus. Bot. Lugd.-Bat. 2 (1865)

39; Boerl. in Icon. Bog. 1 (1899) 130 T. 43 f, D. *Oxymitra bassiaefolia* Teysm. et Binn. in Nat. Tijdschr. Nederl. Ind. 25 (1863) 419. *Fissistigma prismaticum* (Hk. f. et Th.) Merr. in Phil. Journ. Sc. Bot. 15 (1919) 135. ? *F. rigidum* (Ridley) Merr. in Philip. Journ. Sc. Bot. 15 (1919) 130; Sinclair in Sarawak Mus. Journ. 5/3 (1951) 600. *F. cylindricum* (Maingay ex Hk. f. et Th.) Merr. in Phil. Journ. Sc. Bot. (1919) 131.

Climber. *Young twigs* very shortly rusty-pubescent, soon dark coloured, striate and with numerous lenticels. *Leaves* shining, dark green above, drying dark brown, lower surface glaucous, drying medium brown, oblong to elliptic-oblong, apex acute, base rounded, glabrous on both surfaces or sometimes minutely and sparsely rusty-pubescent on the lower surface, especially in young leaves. main nerves 12–18 pairs, having equally prominent shorter secondary ones between them, oblique, faint above, more distinct on lower surface; reticulations not scalariform, forming a rather loose network; length 11–26 cm.; breadth 4–8·5 cm.; petiole 1–2 cm. long. *Flowers* axillary or terminal, solitary or in pairs, odourless; buds triquetrous, tapering from a bulbous base. *Pedicels* 7 mm.–1 cm. long, rufous-tomentose with 2 minute, obtuse bracts at base and a larger, obtuse, sub-median one. *Sepals* connate in a flat, circular or obtusely 3-angled disc, 5–7 mm. broad, pubescent outside, glabrous and tubercled inside. *Outer petals* coriaceous. linear-lanceolate, acute 5–8 cm. long when mature, triquetrous. rusty-tomentose outside, puberulous inside and pale yellow; inner 1 cm. long only, ovate, sharply acute, ridged down the middle outside, puberulous except the much excavated base inside, yellow. *Stamens* 3 mm. long, the connectives slightly produced and obtuse. *Ovaries* 6, elongate, tomentose, 4 mm. long; style short, stigma capitate, minutely lobulate over entire surface. *Ripe carpels* oblong, slightly narrowed at base and apex, tuberculate, (sometimes only slightly rough) pubescent, becoming sub-glabrous, 3–5 cm. long, about 2·5 cm. in diam.; stalks 2·5 cm. long. *Seeds* in 2 rows. dark brown, shining.

KEDAH: Koh Mai F.R., *Kiah S.F.N. 35218* (S.).

PENANG: Back of West Hill, *Curtis 1046* (S., Kew); Bukit Padre. *Curtis 1275* (S., Kew); *Maingay 108* (Kew) type of *Melodorum Maingayi*.

PROVINCE WELLESLEY: Nibong Tebal, *Curtis, July 1900* (S.); *Wall. Cat. 6455* (C.); *Scortechini,* no data (Kew).

PERAK: Gunong Batu Puteh, *Wray 1112* (S., C., Kew); Tupai, *Wray 2447* (S., C., Kew); Larut, *King 5137* (S., C., Kew); *3922* (S., C.); *3932* (S., C.); *6496* (C., Kew); *5610* (C.); Gopeng, Kinta, *King 5810* (S., C.); *4596* (C., Kew); *4384* (C., E.); Waterfall Hill, *Wray 2086* (S., C.); roadside near Swimming Club, foot of Maxwell's Hill, *Sinclair S.F.N. 38820* (S., E., Kew).

MALACCA: *Maingay 78* (type of *Melodorum cylindricum*) (C., Kew); *Maingay 74* (C., Kew); Bukit Senggeh, *Goodenough 1458* (S.).
SINGAPORE: Chan Chu Kang, *Ridley 5078* (S., C., Kew); Kranji, *Ridley 6344* (S.); Bukit Timah, *Goodenough, 10th March, 1896* (S.); Jurong, *Corner S.F.N. 26152* (S., Kew).
DISTRIBUTION: Siam, Borneo and Sumatra.

This species has been kept in *Fissistigma* (*Melodorum*) by most workers. It has been placed in the section *Pyramidanthe* by Kurz, King, Ridley and others. I felt that here there are too many differences for this plant to be kept in *Fissistigma* and I have followed Miquel and Boerlage in considering *Pyramidanthe* as a distinct genus and not merely a section of *Fissistigma*. The chief points of difference are:—

(1) Leaves have secondary nerves; the reticulations are not scalariform.
(2) The flowers are axillary, an important point.
(3) The sepals are united into a flat, spreading, collar-like disc with the three lobes absent or vestigial.
(4) The inner petals are very much shorter than the outer.
(5) The connectives of the stamens are slightly shorter than those of *Fissistigma*.
(6) The stigmas are capitate and minutely lobed over their entire surface. This difference coupled with the axillary flowers probably gives the best grounds for separation.

Pyramidanthe is closer to *Mitrella* than to *Fissistigma*. It is probably also closer to *Xylopia* than to *Fissistigma*.

I have seen *Maingay 78* type of *Melodorum cylindricum* in Kew and Calcutta herbaria. It is identical with *P. prismatica*. Many specimens labelled *F. cylindricum* are *F. fulgens*.

I can see no difference between *F. Maingayi* Hk. f. et Th. and *P. prismatica* and so reduce the former.

F. rigidum (Ridley) Merr. is probably the same as *P. prismatica* (see Sinclair in Journ. Sarawak Mus. Vol. 5 No. 3 (1951) 600.

24. MITRELLA Miq. Ann. Mus. Bot. Lugd.-Bat. 2 (1865) 38; Boerl. in Icon. Bog. Fasc. 2 (1899) 129; Diels in Engl. Jahrb. 49 (1912) 149 et 52 (1915) 183. Usually included in *Fissistigma* (*Melodorum*) section *Kentia* Hk. f. et Th.

Climbers. *Leaves* with faint veins, a secondary one present between the two main ones, reticulations close, not scalariform. *Flowers* axillary. *Sepals* 3, valvate, persisting in fruit and separated from the carpel stalks by a short interval of torus. *Petals* 6,

valvate, in two series, coriaceous; the outer ovate or oblong-ovate with thickened edges and concave at the base; the inner much shorter, thickened, triquetrous above, concave at base. *Stamens* numerous, filaments about half as long as the anther cells, connectives orbicular, obtuse, slightly produced. *Ovaries* with 2–8 ovules in 2 rows, glabrous; style sub-terete, not expanded at stigmatic portion. *Seeds* black, pitted.

TYPE OF GENUS: *M. Kentii* (Bl.) Miq. in Ann. Mus. Bot. Lugd.-Bat. 2 (1865) 39.

DISTRIBUTION: Malaya, Borneo, Sumatra and New Guinea. Five species.

I have followed Miquel, Boerlage and Diels in keeping this genus separate from *Fissistigma* to which it is related. *Mitrella* is included in the section *Kentia* of *Melodorum* by King, Ridley and others and by Merrill in *Fissistigma*. It is closer to *Pyramidanthe* than anything else but I have not united them. It agrees with *Pyramidanthe* in having secondary veins and the reticulations not scalariform and axillary flowers with the inner petals much shorter than the outer. It however differs in the shape of the petals, the glabrous ovary, the non-capitate stigma and the pitted seeds.

There is a distant affinity with *Xylopia* which, too, has secondary nerves present between the main ones, axillary flowers, and the inner petals triquetrous. The sub-terete style of *Mitrella* resembles that of some of the *Xylopia* species. The ovate petals of some species of *Xylopia* recall those of *Mitrella*. *Xylopia* is probably closer to *Mitrella* and *Pyramidanthe* than to *Fissistigma* (*Melodorum* section *Eumelodorum*).

M. Kentii (Bl.) Miq. in Ann. Mus. Bot. Lugd.-Bat. 2 (1865) 39; Boerl. in Icon. Bog. Fasc. 2 (1899) 130.

Basonym: Unona Kentii Bl. Bijdr. (1825) 16.

Synonyms: Polyalthia Kentii Bl. Fl. Jav. Anon. (1830) 77 T. 38, 52A. *Melodorum Kentii* Hk. f. et Th. Fl. Ind. 1 (1855) 116. *Fissistigma Kentii* (Bl.) Merr. in Phil. Journ. Sc. Bot. 15 (1919) 132. *Fissistigma mabiforme* (Griff.) Merr. in Philipp. Journ. Sc. Bot. 15 (1919) 13. *Uvaria mabiformis* Griff. Notul. 4 (1854) 709. *Melodorum pisocarpum* Hk. f. et Th. Fl. Ind. 1 (1855) 123 et in Fl. Br. Ind. 1 (1872) 82; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 361 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 142 Pl. 187A; Ridley, F.M.P. 1 (1922) 88. *Fissistigma elegans* (Hk. f. et Th.) Merr. in Philipp. Journ. Sc. Bot. 15 (1919) 131. *Melodorum elegans* Hk. f. et Th. Fl. Ind. 1 (1855) 122 et in Fl. Br. Ind. (1872) 82; Miq. Fl. Ind. Bat. Vol. 1 Pt. 1 (1858) 36; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 360 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 141 Pl. 184B; Ridley, F.M.P. 1 (1922) 88.

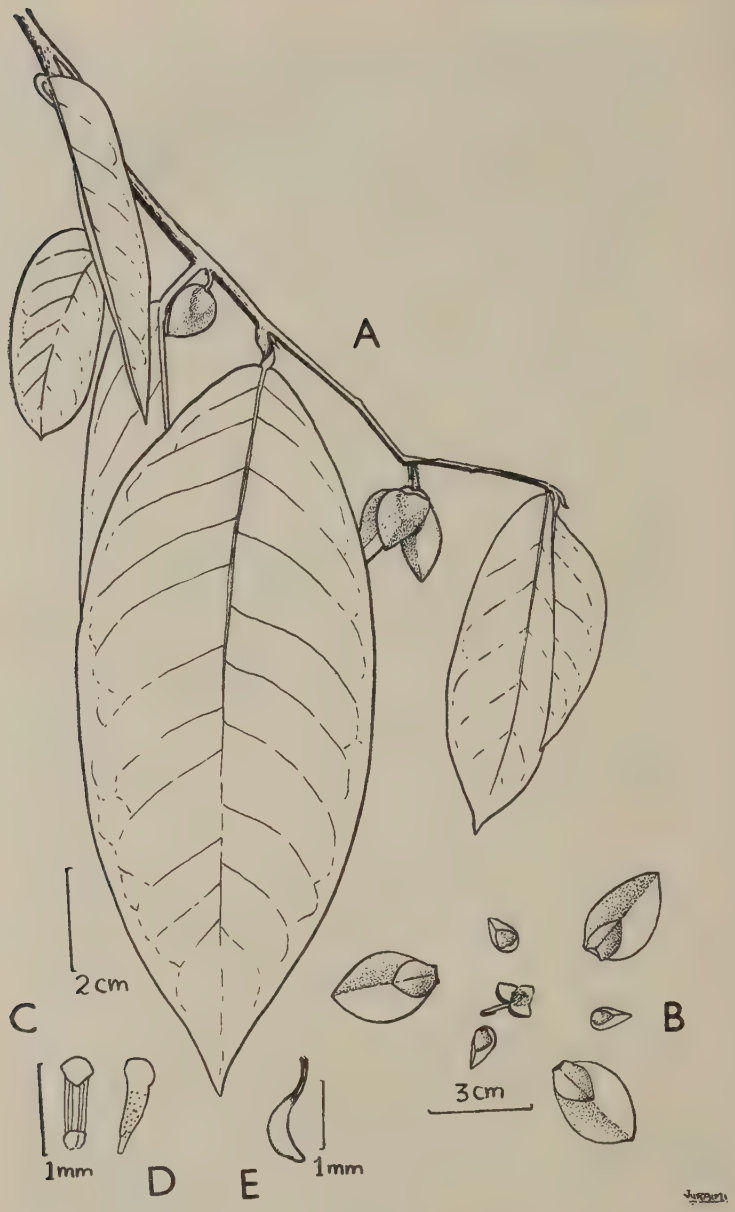


Fig. 27. *Mitrella Kentii* (Bl.) Miq.
A, Flowering twig. B, Flower with petals detached. C, Stamen, front view. D, Stamen, side view. E, Gynoecium.

Climber. *Young twigs* very minutely rusty-puberulous, soon glabrous, dark coloured, finely striate. *Leaves* thinly coriaceous, variable in shape, oblong-lanceolate to elliptic-oblong, sometimes obovate, drying dark brown or sometimes a greyish metallic colour, glabrous except the minutely adpressed-pubescent lower midrib, apex acute or acuminate, base rounded or slightly acute, main nerves 12–14 pairs, very faint on both surfaces; reticulations very faint or not visible above, faint, below, rather close but not scalariform; length 3·5–11 cm.; breadth 3·3–5 cm.; petiole 5 mm.– 1 cm. long, minutely pubescent. *Flowers* solitary, axillary or 2–3 in a fascicle. *Pedicels* slender, 1–1·2 cm. long, minutely rusty-adpressed-pubescent, often deflexed, with 2–3 minute, basal bracts. *Sepals* ovate, acute, united at base, rusty-pubescent outside, glabrous inside, 3 mm. long. *Petals* coriaceous, outer ovate-oblong with a prominent mid-vein, acute, the edges thick, orange, tomentose outside, pubescent inside (grey when dry) with a glabrous patch at the concave base inside, 1–1·2 cm. long; inner only 4–5 mm. long, triquetrous and pubescent above, concave and glabrous at the base inside. *Stamens* 1·5 mm. long with filaments half as long as the anther cells, connectives obtuse, slightly produced. *Ovaries* 2 mm. long, narrowly oblong; glabrous, slightly curved, grooved from the stigma downwards, tapering into the terete style, not enlarged or capitate at the minute stigmatic portion; ovules 1–8 in 2 rows. *Ripe carpels* ovoid to spherical, obtuse, glabrous, 7 mm.–1 cm. in diam.; stalks slender, 1–1·2 cm. long. *Seeds* 1–5 depending on size of carpels, black, pitted, circular, 5–6 mm. across. **Fig. 27.**

PENANG: *Porter, Wall. Cat. 6474A* (C., E., Kew) type material of *Uvaria elegans; King 1371* (S., C., E.); Government Hill, *Curtis 730* (S., Kew).

PERAK: *Scortechini 1877* (C.); *865* (C.); Larut, *King 6819* (C.); *6236* (C., D.D., E.); *6432* (C., D.D.); *5369* (C., D.D., E.); *6411* (C., D.D., Kew); *5209* (D.D.); *3344* (S., C., Kew); *5258* (S., C., D.D.); Ulu Bubong, *King 10602* (C., D.D., E., Kew); Batu Togoh, *Wray 2149* (S., C.); Relau Tujor, *Wray 2889* (S., C., Kew); Waterfall Hill. *Wray 1823* (S.); *1079* (C.); Sungei Larut, *Wray 3065* (S., C., Kew); Changkat Serdang, *Wray 731* (S., Kew); Tapah, 11th mile toward Jor, *Haniff S.F.N. 14267* (S., K.).

SELANGOR: Klang Gates, *Hume F.M.S. Mus. Herb. 7261* (S.); *Symington 39393* (K.); 19th mile Ginting Simpah, *Strugnell 12678* (S.); 13th mile G. Simpah, *Strugnell 13608* (S.); Bukit Kutu, Kuala Kubu. *Osman 23856* (S., K.); Sungei Buloh, *Hamid C.F. 2580* (S.); 33rd mile Rantau Panjang, *Ja'amat 12782* (S., K.).

MALACCA: *Maingay 75, 76* and *77* (C., Kew); *Griffith 389* (Kew) type material of *Uvaria mabiformis; Griffith 442* (Kew); Selandor. *Alvins 628* (S.); Sungei Ujong, *Alvins 2164* (S.); Sedanan F.R., *Holttum S.F.N. 9665* (S., K.); Bukit Rejang, *Derry 926* (S.); Kemandor. *Burkill S.F.N. 2510* (S., K., Kew).

JOHORE: Sungei Kayu, *Kiah S.F.N. 32005* (S.); S. Sedili, *Ngadiman S.F.N. 36820* (S.); *S.F.N. 36893* (S., K., Kew); Sedenak, *Ridley 13516* (S., Kew).

SINGAPORE: Mandai Road, *Holttum, 28th November, 1934* (S.); Bukit Mandai, *Ridley 2117* (S.) and *2114* (S., C.); Chan Chu Kang, *Ridley 356* (S.); Jurong, *Corner S.F.N. 26157* (S., C., K., Kew); Toas, *Ridley 295* (S.); Bukit Timah, *Ridley 6345* (S., C.) and *6770* (S.); Reservoir Jungle, *Corner S.F.N. 31478* (S., K., Kew); edge of forest at Rifle Range behind Nee Soon Forest, *Sinclair, 17th June, 1950* (Kew).

DISTRIBUTION: Java, Sumatra and Borneo.

This species is rather variable as regards its leaves. Some are narrower and longer while others are broader and shorter but there are also intermediate forms. The number of ovules is not a reliable character as far as I can see. The number depends on the size of the carpel and the amount of nourishment it has had, so I cannot maintain the two Malayan species given by Ridley and King as separate. Further I have examined type material of *Mitrella Kentii* in Kew and the Malayan plants do not seem to be different from it. Hence I have used the oldest name *Mitrella Kentii.*

25. MELODORUM Loureiro Fl. Cochinch. (1790) 351 non auct.

Synonym: Sphaerocoryne Scheff. in Boerlage Icon. Bogor. (1899) 195.

Shrubs or climbing shrubs. *Leaves* glabrous with primary and secondary veins. *Flowers* solitary, axillary or terminal. *Sepals* 3, valvate, connate, persistent in fruit. *Petals* 6, valvate, coriaceous, concave inside, the outer spreading; the inner remaining for a long time closed over the sexual organs, slightly smaller. *Stamens* with linear anthers, flat-topped connectives, large pollen grains and short filaments. *Ovaries* narrowly oblong with short, grooved style not expanded at the stigmatic tip. *Torus* convex or depressed in centre. *Carpels* numerous on slender stalks. *Seeds* 1, or less often 2, smooth, shining.

TYPE OF GENUS: *M. fruticosum* Lour. Fl. Cochinch. (1790) 351.
DISTRIBUTION: Siam, Indo-China and Malaya. 2 or 3 species.

Merrill in Philipp. Journ. Sc. Bot. 15 (1919) 125 gives very good reasons why *Melodorum* Lour. should be retained for a species more usually known as *Sphaerocoryne clavipes* (Hance) Craib. However in quoting synonyms Merrill has included two species under *M. fruticosum,* the type of Loureiro's *Melodorum.* He does however suggest that there may be more than one species included in his list of synonyms. The other species included is

Sphaerocoryne aberrans (Maingay ex Hk. f. et Th.) Ridley = *Polyalthia aberrans* Maingay ex Hk. f. et Th. which I call *Melodorum aberrans.*

Loureiro's other species of *Melodorum, M. arboreum* is not congeneric with his *M. fruticosum* the type of the genus but is probably *Mitrephora Thorelii* Pierre. There is no herbarium specimen of *M. arboreum* preserved.

Subsequent species of *Melodorum* added by Dunal, Hooker f. and Thomson and later authors are not congeneric with Loureiro's *Melodorum* and most of them are now put in *Fissistigma.* (See my notes under *Fissistigma*). The systematic position of the genus *Melodorum* of Lour. is not at first sight clear and has given much trouble to authors who have attempted to find a place for it. It does in fact resemble several genera, some more than others and hence the long list of synonyms. Merrill thinks it is most closely related to *Popowia* but I can not see much relation there. It does resemble *Polyalthia* especially in the fruit and seeds and also in the stamens. The petals however are rather different and the inner ones are not spreading.

I venture to place it in the *Xylopieae.* It may be one link between the *Xylopieae* and the *Unoneae.* It resembles *Mitrella* in having secondary veins, axillary flowers, concave petals and a similar style. The carpels too are rather similar but the most striking resemblance is found in the connate sepals, persistent in fruit with an interval of torus between them and the carpel stalks. The relation to *Xylopia* is evident but more remote. The characters in common are the secondary veins in the leaves, the axillary flowers and the large pollen grains. The fruit in *Xylopia* however is different.

KEY

a. Ovaries glabrous; torus not depressed in centre

(1) **M. aberrans**

a. Ovaries tomentose; torus depressed in centre

(2) **M. fruticosum**

(1) **M. aberrans** (Maingay ex Hk. f. et Th.) J. Sinclair in Gard. Bull. Singapore 14 (1953) 41.

Basonym: Polyalthia aberrans Maingay ex Hk. f. et Th. Fl. Br. Ind. 1 (1872) 67; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 312 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 78 Pl. 109A.

Synonym: Sphaerocoryne aberrans Ridley in Journ. Roy. As. Soc. Str. Br. 75 (1917) 8 et F.M.P. 1 (1922) 61; Craib, Fl. Siam. Enum. (1925) 47 *syn. Pierreano excl.*

Climbing shrub. *Young twigs* slender, glabrous, black, finely striate. *Leaves* membranous, oblong-lanceolate, acute or acuminate, base slightly cuneate, glabrous, shining above, glaucous beneath; main nerves 14–18 pairs, fine, the secondary quite as well marked; reticulations rather lax, fine on both surfaces; length 9–12 cm.; breadth 3·5–4·5 cm.; petiole 5–7 mm. long. *Flowers* solitary, axillary or terminal. *Pedicels* slender, glabrous but slightly rough, somewhat thickened below calyx, 3–3·5 cm. long, lengthening in fruit, bearing 2–3 minute bracts at base and another slightly below the middle. *Sepals* orbicular-triangular, acute, connate in a 3-angled, glabrous cup 7 mm. in diam.; persistent in fruit and separated from the petals by a 2–3 mm. interval of torus. *Petals* coriaceous, yellowish, ovate-orbicular, acute, 1-veined, spreading, concave inside; the outer 8 mm.–1 cm. long, minutely tomentose on both surfaces except the base inside, inner slightly smaller and more concave, puberulous outside, glabrous at base inside. *Stamens* numerous with linear anthers and short filaments, the connectives flat-topped. *Ovaries* narrowly oblong, glabrous, 1–2 ovuled; style as long as ovary, stigmatic portion small but not swollen. *Torus* convex. *Ripe carpels* ovoid, slightly apiculate, glabrous, 8 mm. long and 7 mm. in diam.; stalks slender, glabrous, 1·8–2·5 cm. long. *Seeds* 1, occasionally 2, pale brown, smooth, shining.

PERAK: *Scortechini 1946* (S., C.); Upper Perak, *Wray 3633* (S., C., D.D.); *Wray 3487* (S., C.); *Wray 3437* (E.); near Ulu Selangor, *King 8631* (C.).

PAHANG: Tembeling, *Henderson S.F.N. 24541* (S., C.).

NEGRI SEMBILAN: Bukit Kangong, *Alvins ? 1047* (S.) (Figure 4 not clear).

SINGAPORE: One sheet, no locality, probably Ridley. No recent collections (S.).

DISTRIBUTION: Lower Siam.

I have not seen this species in Singapore.

(2) **M. fruticosum** Lour. Fl. Cochinch. (1790) 351.

Synonyms: M. clavipes Hance in Journ. Bot. 15 (1877) 328. *Sphaerocoryne clavipes* Craib in Kew Bull. (1922) 168 et in Fl. Siam. Enum. 1 (1925) 47. *Popowia Mesnyi* Craib in Kew Bull. (1914) 5. *P. aberrans* Pierre ex Finet et Gagnep. in Bull. Soc. Bot. Fr. Mém. 4 (1906) 109 et Fl. L'Indo-Chine (1907) 83. *P. diospyrifolia* Pierre ex Finet et Gagnep. in Bull. Soc. Bot. Fr. Mém. 4 (1906) 53. *Polyalthia siamensis* Boerl. in Icon. Bogor. (1899) 124 and 195 T. 69. *Unona Mesnyi* Pierre Fl. For. Cochinch. 1 (1880) T. 17 *pro parte*.

Shrub. *Twigs* as in *M. aberrans*. *Leaves* as in *M. aberrans*, pale brown beneath in herbarium material. *Flowers* solitary, axillary or terminal. *Pedicels* 2 cm. long, thickened below calyx; bract as in *M. aberrans*. *Sepals* broadly triangular, connate 3–4 mm. long, puberulous or glabrous outside, glabrous inside. *Petals* coriaceous, nearly orbicular, acute with broad base, tomentose outside, puberulous inside except the base, concave inside; outer about 1 cm. long and 1·1 cm. broad, the inner slightly smaller, thicker and more concave. *Stamens* 2 mm. long, connectives flat-topped, pollen grains large, visible under a lens. *Torus* depressed in centre. *Ovaries* 2 mm. long, elongate, tomentose, with short style, grooved on the inner side from the stigmatic portion downwards, stigma small, not thickened, expanded or distinct from style. *Ripe carpels* as in *M. aberrans*.

LOWER SIAM: Chantaboon, *Vesterdal 4V* (S.); Poongah, *Curtis 2957* (S.).

DISTRIBUTION: Indo-China.

This species differs from *Melodorum aberrans* in the tomentose ovaries and the depressed torus.

Tribe 4. MILIUSEAE

Sepals valvate. *Petals* valvate, sometimes broad at the base or saccate, the outer like the sepals in size and shape, free, the inner larger or about the same size, free or tending to cohere by the margins or cohering in a mitriform fashion over the sexual organs. *Stamens* few, loosely imbricate, anther cells not concealed by the connectives; connectives flat-topped or pointed.

KEY

a. Inner petals not mitriform, or vaulted over the sexual organs

b. Stamens truncate; carpels 1-seeded

c. Secondary nerves present, primary interarching in a prominent line 5–6 mm. from the margin; inner petals subterete and acuminate in the upper part **26. Marsypopetalum**

c. Secondary nerves absent, primary not or interarching in a broken indistinct line 2–3 mm. from margin; inner petals flat or slightly triquetrous, obtuse or acute **27. Phaeanthus**

b. Stamens with a pointed or rounded projecting connective; carpels 1-several seeded

d. Sepals and outer petals equal and alike; inner petals saccate or not at the base; flowers axillary or by growth appearing extra-axillary; style present, elongate; 1-several seeds **28. Miliusa**

d. Sepals and outer petals dissimilar in size and appearance, both sets of petals sub-equal, saccate at the base and apices, the apices usually reflexed; flowers extra-axillary; style absent; seeds several **29. Alphonsea**

a. Inner petals mitriform, vaulted over the sexual organs so that 3 arches or spaces are present at the base of the petals, the blades cohering or at least cohering at first

e. Claw long and narrow, blade deltoid, hastate or trapezoid but distinct from claw; carpels 3–5, globose or narrow-elongate, thin-walled, 1–2 mm. thick **30. Orophea**

e. Claw not distinct from blade which is narrowed at base; carpels 1–2, globose with a hard, thick wall, 5 mm. thick **31. Platymitra**

The inner petals of *Platymitra* and *Orophea,* especially the latter are like those of the *Mitrephoreae* but the stamens are miliusoid. These two genera seem to stand half way between the *Miliuseae* and *Mitrephoreae.*

26. MARSYPOPETALUM Scheffer in Tijdschr. Nederl. Ind. 31 (1870) 342 et in Flora 53 (1870) 243.

Monotypic genus. Shrub. *Leaves* coriaceous, nerves forming a well-marked line where they anastomose. *Flowers* solitary, extra-axillary. *Sepals* 3, valvate. *Petals* in two series, valvate; the outer smaller and not much larger than the sepals; the inner thick and concave at the base, not clawed, enclosing the sexual organs, subterete, apex acute, recurved. *Stamens* numerous with truncate connectives not concealing the pollen sacs. *Carpels* numerous; stigma capitate, pilose. *Torus* not much enlarged in fruit, depressed, somewhat globose. One erect basal seed.

M. pallidum (Bl.) Kurz in Journ. As. Soc. Beng. New Ser. Part 2, Vol. 43 (1874) 201.

Basonym: Guatteria pallida Bl. Bijdr. (1825) 20 et in Fl. Jav. Anon. 97 (1830) Pl. 48 (non. Hk. f. et Th.).

Synonyms: M. ceratosanthes Scheff. in Tijdschr. Nederl. Ind. 31 (1870) 343 et in Flora 53 (1870) 244. *M. pallidum* (Bl.) Baker in Schoolflora voor Java (1911) 36.

Shrub about 10 feet high. *Bark* of young twigs dark brown, pubescent and closely striate. *Leaves* coriaceous, dark green

above, paler beneath, somewhat shining and yellowish when dry, oblong to oblong-lanceolate, acute at base and apex, glabrous above and sometimes thinly pubescent below on midrib and veins, becoming glabrous; midrib and 8–10 pairs of nerves slightly depressed above, raised below, the line of interarching prominent and 3–5 mm. from the slightly recurved margin; secondary nerves and reticulations present; length 12–20 cm. –(33 cm.), breadth 4–6 cm. –(10 cm.); petiole rough, pubescent, becoming glabrous, 1 cm. long. *Flowering peduncles* 1 cm. long with 1–2 minute bracts at base. *Flower buds* developing slowly and remaining dormant for one year, opening the next. *Sepals* very small, ovate, acute, adpressed strigose. *Petals* 1·5–3 cm. long, adpressed-pubescent. *Stamens* numerous with truncate connectives. *Ripe carpels* red, black when dry, oblong, narrowed at both ends, rough and minutely pubescent, 1·5–2 cm. long by 7 mm. broad; stalks 1·7–2 cm. long, slender, rough and pubescent. *Seeds* elongate, filling the carpel, reddish-brown.

MALACCA: Base of Gunong Mering, *Ridley, June 1892* (S.) with larger leaves than the Johore and Java specimens.

JOHORE: Sungei Kayu, Mawai-Jemaluang Road, *Corner S.F.N. 32469* (S.); Sungei Segun, Gunong Panti, *Corner S.F.N. 30729* (S.) in swampy forest.

DISTRIBUTION: Java, Borneo.

This species has not been recorded previously from Malaya. Nearest affinity is with *Phaeanthus* but it differs in leaf texture and venation and also in the inner petals being thick and concave at base and sub-terete and acuminate in upper part.

27. PHAEANTHUS Hk. f. et Th. Fl. Ind. 1 (1855) 146.

Small trees or shrubs. *Leaves* with rather straight, obliquely ascending nerves; no secondary nerves present. *Flowers* hermaphrodite, extra-axillary, solitary or 2–3 on a very short, bracteolate peduncle which bears the pedicels. *Sepals* and *outer petals* more or less similar, much smaller than the inner petals. *Inner petals* flat or triquetrous, coriaceous, veined or not. *Stamens* several, the ends of the pollen sacs obtuse, connectives flat-topped, not concealing the pollen sacs, filaments about the same length as the anthers. *Ovaries* cylindrical with distinct style and elongated club-shaped stigma, one-seeded, the ovule inserted slightly above the base. *Torus* small, not enlarged. *Ripe carpels* several, stalked, thin-walled.

TYPE OF GENUS: *P. nutans* Hk. f. et Th. (1855) which is a synonym of *P. ophthalmicus* (Roxb. ex Don) J. Sinclair.

DISTRIBUTION: South India, Lower Burma, Cambodia, Malay Peninsula to New Guinea and Philippines. Species about 20.

KEY

a. Leaves softly pubescent, nerves 15–19 pairs; inner petals flat, 2–2·5 cm. long, 5-veined; ripe carpels 1·5 cm. long
(1) **P. ophthalmicus**

a. Leaves glabrous, nerves 8–11 pairs; inner petals triquetrous, c. 1·2 cm. long, not veined; ripe carpels 2–2·4 cm. long
(2) **P. crassipetalus**

The stamens are miliusoid though this is not at first sight readily apparent. Young stamens with unopened pollen sacs should be examined. The filament occupies one third to over one half of the whole stamen, the sacs are dorsal with obtuse, rounded ends and are not sunk in the connective but stand out well from its surface. The top of the connective is flat-topped and has an anterior projection which does not hide or project over the pollen sacs.

The nearest related genus is probably *Marsypopetalum.*

(1) **P. ophthalmicus** (Roxb. ex Don) J. Sinclair, **comb. nov.**

Basonym: Uvaria ophthalmicus Roxb. ex Don, Gen. Syst. 1 (1831) 93.

Synonyms: U. tripetala Roxb. Fl. Ind. 2 (1832) 667. *Phaeanthus nutans* Hk. f. et Th. Ind. (1855) 147 et in Fl. Br. Ind. 1 (1872) 72; Miq. Fl. Ind. Bat. 1 Pt. 1 (1858) 51; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 371 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 152 Pl. 200A; Ridley, F.M.P. 1 (1922) 95.

Small shrub. *Young twigs* rusty-tomentose. *Leaves* papery, turning black on drying, oblong-lanceolate or slightly obovate-elliptic, base acute, apex acuminate, glabrous above except the midrib, pubescent on the nerves and midrib beneath; nerves 15–19 pairs, straight, oblique and nearly parallel, interarching in a faint line close to the margin; reticulations indistinct on upper surface but visible below; length 12·5–23 cm.; breadth 3·5–9 cm.; petiole 7 mm. long, tomentose. *Flowers* extra-axillary, usually solitary but sometimes 2 on a short 5 mm. long peduncle with about 4 linear, 2–5 mm. long bracts at the base; pedicels 3·5–4 cm. long, tomentose. *Sepals* and *outer petals* similar, about 5 mm. long, filiform, brownish-pubescent on both surfaces. *Inner petals* much larger, 2–2·5 cm. long and 1·5 cm. broad at middle, green, flat, minutely pubescent, 5-veined, acute, oblong with broad base. *Stamens* nearly 2 mm. long, green, anther cells white, connectives flat-topped and slightly incurved. *Ovaries* c. 2·5 mm. long, cylindrical, pubescent; stigma somewhat club-shaped, slightly elongated with a distinct stylar portion. *Torus* hemispherical, not massive. *Ripe*

carpels numerous, pubescent, becoming glabrous, thin-walled, ovoid to oblong, apex shortly apiculate; length 1·5 cm. *Seed* 1, filling the carpel, pale brown. **Fig. 28.**

A common shrub in shady forests. There are numerous records from the following states in Malaya:—Penang, Perak, Pahang, Selangor, Negri Sembilan, Malacca, Johore and Singapore.

DISTRIBUTION: Java.

Fig. 28. *Phaeanthus ophthalmicus* (Roxb. ex Don) J. Sinclair.
A, Leafy twig. B, Flowering twig. C, Flower. D, Part of flower showing stamens and carpels. E, Stamen, front view. F, Stamen, side view. G, Stamen, back view. H, Gynoecium.

(2) **P. crassipetalus** Becc. in Nuov. Giorn. Bot. 3 (1871) 191.

Synonym: P. lucidus Oliver in Hook. Icon. Pl. (1887) T. 1561; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 371 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 153 Pl. 200B; Ridley, F.M.P. 1 (1922) 96.

Small tree. *Young twigs* rusty-pubescent, soon glabrous. *Leaves* thickly membranous, slightly black in dried specimens, shining and glabrous on both surfaces except occasionally the puberulous midrib, oblong-elliptic to lanceolate, acuminate, base acute, nerves 8–11 pairs, prominent below; straight and obliquely ascending as in the previous species, also interarching close to margin; reticulations visible only on lower surface; length 11–22 cm. and breadth 3–6 cm.; petiole 5 mm. long. *Flowers* solitary, occasionally in pairs or threes, extra-axillary on a very short peduncle about 4 mm. long with a few minute bracts; pedicels 2–4 cm. long, minutely pubescent. *Sepals* and *outer petals* similar, triangular, acute, about 2 mm. long, pubescent. *Inner petals* forming a triquetrous bud, thick, coriaceous, oblong-ovate, acute, pubescent, greenish-yellow c. 1·2 cm. long and 8 mm. broad at middle. *Stamens* 1·5 mm. long with flat-topped connectives and the filaments nearly as long as the anthers. *Ovaries* 2·5 mm. long, pubescent, cylindrical, not quite straight; stylar portion distinct ending in the club-shaped stigma. *Torus* small as in previous species. *Ripe carpels* several, oblong, apiculate, thin-walled, nearly glabrous, 2–2·4 cm. long and 1 cm. in diameter; stalks c. 2 cm. long. *Seed* single.

KEDAH: Yan, *Ridley, date 1893* (S.).

PENANG: Penara Bukit, *Curtis 839* (S., C., Kew) type material of *P. lucidus;* Waterfall, *Curtis 1407* (S., C., Kew) type material of *P. lucidus;* Penang Gardens, *Ridley 14149* (S., Kew); *Sinclair S.F.N. 39031* (S., E., Kew).

PERAK: Tupai, *Wray 3300* (S.); *3096* (S., C.); Upper Perak, *Wray 3507* (S., C.); Ulu Bubong, *King 10044* (S., Kew); Larut, *King 7275* (C., Kew).

PAHANG: Bentong, west side, *Burkill* and *Haniff, S.F.N. 16556* (S., Kew).

SELANGOR: Public Gardens, Kuala Lumpur, *Ahamad C.F. 2485* (S., K., Kew); *Foxworthy 5021* (K., Kew).

DISTRIBUTION: Borneo, Sumatra.

After examining type material of *P. crassipetalus* Becc. in Kew I failed to see how *P. lucidus* differs from it and have been compelled to make *P. lucidus* a synonym.

P. crassipetalus does not appear to be as common as the preceding species. There are no records from Singapore or Johore. It is easily distinguished from the preceding species by its glabrous leaves with fewer nerves, the smaller flowers, the inner petals being triquetrous but not 5-veined and the larger carpels.

28. MILIUSA Leschenault in A. DC. Mém. Soc. Genèv. 5 (1832) 36 including *Saccopetalum* Bennett, Pl. Rar. Jav. (1840) 165.

Shrubs or small trees. *Flowers* usually hermaphrodite, occasionally dioecious or polygamous, solitary, in twos or threes, or in cymose fascicles often with slender pedicels, axillary or in the axils of fallen leaves in which case they may appear extra-axillary owing to the development of young leaves or shoots on their peduncles. *Sepals* and *outer petals* valvate, similar, equal, or about the same length. *Inner petals* valvate, always larger, thickened, fleshy or saccate in various degrees at the base, cohering at their edges at first, later free. *Stamens* few or numerous with distinct filaments, connectives not concealing the anther cells and apiculate or rounded above. *Ovaries* slightly elongated and curved with a globose or elongated club-shaped stigma. *Ovules* 1 to about 10. Torus not enlarged, pubescent. *Ripe carpels* thin-walled, stalked, occasionally sub-sessile.

TYPE OF GENUS: M. indica Lesch. in A. DC. Mém. Soc. Genèv. 5 (1832) 36 Pl. 3.

DISTRIBUTION: India, Burma, Ceylon, Siam, Malaya, Indo-China, Borneo, Java, Australia. About 40 species.

This genus resembles *Phaeanthus* in having the outer sepals and petals alike with the much larger inner petals but differs in the stamens having apiculate or rounded, not truncate connectives.

The type of the genus, *M. indica* has the inner petals saccate at the base. The drawing in De Candolle's Mémoires shows this clearly. There are two ovules. The genus *Saccopetalum* Bennett was based on *S. Horsfieldii* which also has saccate petals and 6–10 ovules. Later other species with several ovules and saccate petals were described and assigned to *Saccopetalum*. However the saccate character and the number of ovules do not seem to be related as the following will show:—*M. longipes* is saccate with 1–2 ovules, *M. saccata*, saccate with one ovule; similarly *M. elongata* and *M. cuneata* are slightly saccate with one ovule and *M. glandulifera*, with one ovule, is thickened and semi-circular at the base. Several species have 1–2 ovules and are not saccate, eg. *M. amplexicaulis* and *M. andamanica*. *M. parviflora* is not saccate but has 2–6 ovules while a few others placed in *Saccopetalum* have several ovules and are saccate.

Most of the species placed in *Saccopetalum* have flowers in the axils of fallen leaves but the flowers and especially the fruit appear to be extra-axillary because young shoots from the junction of the peduncle and pedicels open and expand their leaves. However *M. velutina* (a species in which the leaves and fruits very much

resemble *S. tomentosum*) also shows this state but its petals are non-saccate and it only has 1–2 ovules. So there seems to be no relation between the number of ovules and saccate or non-saccate character.

The genus *Saccopetalum* was reduced by Baillon [Hist. des Plantes (1871) 244] to *Miliusa* and this view is followed by Ast in Fl. Gén. de L'Indo-Chine. I cannot see any usefulness therefore in retaining *Saccopetalum* as distinct from *Miliusa*.

It is opportune now to make the following five new combinations and one new name in respect of transfer from *Saccopetalum* to *Miliusa* of the following species:—

1. **Miliusa longiflora** (Hk. f. et Th.) J. Sinclair, **comb. nov.**

Basonym: Saccopetalum longiflorum Hk. f. et Th. Fl. Ind. 1 (1855) 151.

2. **Miliusa tomentosa** (Roxb.) J. Sinclair, **comb. nov.**

Basonym: Uvaria tomentosa Roxb. Pl. Corom. 1 (1795) 31 T. 35.

Synonym: Saccopetalum tomentosum Hk. f. et Th. Fl. Ind. 1 (1855) 152.

3. **Miliusa unguiculata** (C.E.C. Fischer) J. Sinclair, **comb. nov.**

Basonym: Saccopetalum unguiculatum C.E.C. Fischer in Kew Bull. (1926) 454.

4. **Miliusa arborea** (Elmer) J. Sinclair, **comb. nov.**

Basonym: Saccopetalum arboreum Elmer, Leafl. Philip. Bot. 5 (1913) 1739.

5. **Miliusa Koolsii** (Kostermans) J. Sinclair, **comb. nov.**

Basonym: Saccopetalum Koolsii Kostermans in Reinwardtia Vol. 1 Pt. 4 (1952) 459. Fig. 1.

6. **Miliusa Vidalii** J. Sinclair, **nom. nov.**

Basonym: Saccopetalum longipes Vidal, Rev. Pl. Vasc. Filip. (1886) 43 non *Miliusa longipes* King (1892).

KEY

Leaves narrowed to base

Length of leaves 12–23 cm.; inner petals 1·2 cm. long, several-veined; stalks of carpels 2–2·5 cm. long, 1 rarely 2-seeded (1) **M. longipes**

Length of leaves 5–9 cm.; inner petals 4–5 mm. long, not veined; stalks of carpels 4 mm. long, seeds 3–6

(2) **M. parviflora**

Leaves sub-sessile, unequally bilobed at base

(3) **M. amplexicaulis**

(1) **M. longipes** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 373 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 157 Pl. 204; Ridley, F.M.P. 1 (1922) 96.

Shrub or tree up to 10 m. high. *Young twigs* glabrous and striate. *Leaves* membranous; oblong-lanceolate or slightly obovate-lanceolate, glabrous, cuneate at base, apex rounded and then acuminate; midrib sunk above, rather sharply angled beneath; main nerves about 12 pairs, faint above, prominent beneath, curving and interarching 5 mm.–1 cm. from margin; reticulations forming a loose open network below, not very prominent; length 12–23 cm.; breadth 4·5–7 cm.; petiole grooved on the upper, conspicuously ringed on the under surface, 3–4 mm. long. *Flowers* axillary, solitary, pendulous on slender, glabrous pedicels 2–4 cm. long with about 4 minute, lanceolate, imbricate bracts at base. *Sepals* and *outer petals* sub-equal, c. 1 mm. long, ovate, sub-acute with ciliate edges. *Inner petals* greenish-yellow outside, dark red inside, about 5-veined, thin in texture, ovate-oblong, obtuse, much inflated at base, 1·2 cm. long and 7 mm. broad. *Stamens* about 18 intermixed with hairs, often bent, 0·5 mm. long, connectives not concealing the anther cells, apiculus broad and shallow. *Young ovaries* numerous, elongate, 1 mm. long, slightly curved with subglobose stigma. *Torus* not enlarged or massive. *Ripe carpels* globular, glabrous, thin-walled, girdled with an oblique furrow, about 8 mm. in diam.; one, rarely two seeded; stalks slender, 2–2·5 cm. long.

KEDAH: Yan, *Ridley, June 1893* (S.); Gunong Lang, *Kiah S.F.N. 35049* (S., K., Kew).

PERAK: Chanderiang, *King 5734* (S., C., E.); Larut, *King Nos. 7162* (C., Kew) and *7352* (C., Kew); Perak, no exact locality, *Scortechini Nos. 710* (S.) and *80* (C.); Gua Badak, Lenggong, *Henderson S.F.N. 23841* (S.).

PAHANG: Sungei Pekin, *Ja'amat 16501* (S., K.); Bukit Chintamani, Bentong, *Henderson S.F.N. 25038* (S., C.) and *S.F.N. 25020* (S.); F. Reserve, Temerloh, *Hamid 10617* (K.).

SELANGOR: Ulu Langat, *Kloss, February 1912* (Kew).

MALACCA: Lubok, Kedondong, *Ridley, June 1892.*

SINGAPORE: Bukit Timah, *Ridley Nos. 8450* (S., Kew) and *4709* (S.).

DISTRIBUTION: Malay Peninsula and Siam. Type material *Scortechini* and *King's* numbers.

Kerr 8824, identified by Craib, ex descr. as *M. campanulata* Pierre, agrees with King's *longipes*. I have named *Kerr 14828* and *15041* from Siam, *M. longipes*. Certainly *M. longipes* is near *campanulata* if not the same, but I have not seen Pierre's type specimen of *campanulata*. *M. campanulata* is an older name than *M. longipes*.

(2) **M. parviflora** Ridley in Journ. Roy. Asiatic Soc. Str. Br. 59 (1911) 65 et F.M.P. 1 (1922) 97.

Small tree with grey bark. *Young twigs* minutely pubescent, soon glabrous. *Leaves* membranous, elliptic-lanceolate, glabrous, often slightly acuminate, the actual apex obtuse, base acute to slightly rounded, usually unequal-sided; nerves about 10 pairs, very fine on both surfaces, curving and interarching about 3 mm. from edge; reticulations not visible above, few and faint beneath; length 5–9 cm.; breadth 1·8–3·5 cm.; petiole very short, 1–2 mm. long, conspicuously ringed. *Flowers* axillary, solitary or in twos on a short 2–10 mm. long peduncle with a few minute bracts at junction of pedicel; pedicel about 1·2 cm. long with a median, lanceolate bract 1 mm. long. *Sepals* and *outer petals* similar, minute, about 1 mm. long, ovate, acute, pubescent. *Inner petals* 4–5 mm. long, ovate-oblong, obtuse, greenish, pubescent outside. *Stamens* few, 1·5 mm. long, filament about half the length of anther, apiculus prominent. *Young ovaries* 2 mm. long, pubescent with elongate, club-shaped stigmas. *Torus* small, not swollen, hairy. *Ripe carpels* thin-walled, granular, glabrous, oblong, slightly apiculate and constricted, 7 mm.–1·8 cm. long; stalks 4 mm. long. *Seeds* 3–6 in 2 rows.

PERLIS: 1. Bukit Lagi, *Ridley 15239* (S.); 2. Tebing Tinggi, *Ridley 15340* (S., Kew); Basih Hangat, *Ridley, March 1910* (S.) 1 & 2 type material.

KEDAH: Batu Ayam, Langkawi, *Corner 19th November, 1941* (S.); Batu Ayam, Selat Panchor, Langkawi, *Henderson S.F.N. 28949* (S., Kew.).

DISTRIBUTION: No other localities as yet except these two states where it is found on limestone.

(3) **M. amplexicaulis** Ridl. Journ. Roy. As. Soc. Str. Br. 54 (1910) 13 et F.M.P. 1 (1922) 97 excluding *Polyalthia subcordata* Bl. Fl. Jav. Anon. (1830) 71.

Small tree. *Young twigs* dark brown-tomentose, becoming glabrous and striate. *Leaves* membranous, nearly sessile, elliptic-ovate, acuminate, base broad, unequally bi-lobed, amplexicaul, glabrous above, pubescent on midrib and nerves; main nerves 12–16 pairs,

rather crooked forming a loop with each other some distance from edge, faint above, fine below but distinct; reticulations a loose and open network, faint on both surfaces; length 11–20 cm.; breadth 5–9 cm.; petiole 3 mm. long, pubescent. *Flowers* axillary, single or 2–3 on a short peduncle 2–4 mm. long with several imbricate, minute, ciliate bracts; pedicels 1–1·3 cm. long with a sub-median similar bract. *Sepals* and *outer petals* similar, ovate, acute, glabrous but ciliate at the margins, 1 mm. and 1·5 mm. long respectively. *Inner petals* broadly ovate-triangular, fleshy, obtuse, glabrous except the ciliate margins, 3 mm. long. *Stamens* in three whorls, curved, about 1 mm. long, filament as long as anther, apiculus of connective rather rounded. *Young ovaries* 2 mm. long, glabrous with club-shaped stigma. *Torus* small with setose hairs about 1 mm. long. *Ripe carpels* 7 mm. long, numerous, glabrous, sub-globose, girdled with a vertical groove, stalks 7 mm. long, glabrous; one-seeded.

KEDAH: Coah (Kwah), Pulau Langkawi, *Curtis 3205*, (S., Kew) type material; Gunong Baling, *Kiah S.F.N. 35363* (S., K., Kew).

PERAK: Ipoh, *Ridley, February 1904* (S.); Lenggong, Larut, *Ridley 14646* (S., C., Kew); Larut, *King 2373* (C., Kew).

DISTRIBUTION: Confined to Kedah and Perak.

Ridley, F.M.P. 97 quotes *Polyalthia sub-cordata* Bl. as a synonym of *Miliusa amplexicaulis*. King in Ann. Roy. Bot. Gard. Calc. 4 (1893) 80 describes *P. sub-cordata* and quotes King's collector *2373* as this species. *King 2373* is not the same as *P. sub-cordata* but is actually *Miliusa amplexicaulis*. King's description and his figure, Pl. 112, do not agree with *M. amplexicaulis*. The inner petals are described as smaller than the outer and the drawing also shows this. His description and drawing agree with *P. sub-cordata* so Ridley was wrong in regarding this *Polyalthia* as a synonym of *Miliusa amplexicaulis*. He followed King's error.

The type, *Curtis 3205* has the midrib and nerves on the underside pubescent while the other material quoted has glabrous nerves and midrib. In other respects the sheets are quite similar.

29. ALPHONSEA Hk. f. et Th. Fl. Ind. 1 (1855) 153.

Tall trees or shrubs. *Leaves* usually coriaceous, shining, mostly glabrous, the margin very slightly revolute. *Peduncles* 1-several, fasciculate, extra-axillary, bearing several pedicels. *Flower buds* conical. *Sepals* 3, valvate, several times smaller than the petals. *Petals* 6, valvate in two series, bases saccate and apices reflexed, the inner set about the same length as outer but slightly narrower.

Torus cylindric or hemispheric. *Stamens* indefinite, miliusoid, the connectives apiculate, produced, not concealing the dorsal anther-cells. *Ovaries* few, 1–8, stigma sessile, U- or horse-shoe-shaped with a slit down the adaxial side; ovules 4–10 in 2 rows. *Carpels* subsessile or stalked, with thick walls, glabrous, tomentose or verrucose.

TYPE OF GENUS: *A. lutea* (Roxb.) Hk. f. et Th. Fl. Ind. 1 (1855) 153 non Teysm. et Binn. (1870). *Basonym: Uvaria lutea* Roxb. Cor. Pl. 1 (1795) T. 36 et Fl. Ind. 2 (1832) 666.

DISTRIBUTION: India, Ceylon, Burma, Siam, Indo-China, China, Malay Islands to N. Guinea. Species about 30.

The Malayan species apart from *A. elliptica* and *Maingayi* seem to be of very local distribution and are quite rare. At least they are poorly represented in the Singapore Herbarium. *A. lucida* has not yet been found in fruit. The genus itself has a wide distribution in South-East Asia but species also tend not to spread outside their areas. For example Siam has a number of local species but the only Malayan ones found there are *A. elliptica* and *A. cylindrica*. There is evidence that there are some undescribed species from Siam and also from Malaya. *Kiah S.F.N. 35235* from Kaki Bukit, Perlis is probably a new species. The specimen is in fruit. Also there is another gathering of a species of *Alphonsea* in fruit only viz. *Nur S.F.N. 32831,* Boh Plantation, Cameron Highlands, Pahang. There are no flowers and the material is insufficient for the purpose of describing it as a new species. More material is wanted.

Alphonsea has some degree of alliance with those genera of the miliusoid stamen series i.e. *Miliusa, Orophea* and *Platymitra*. Further, the nearest affinity probably lies with *Miliusa,* the genus having the inner petals saccate at the base while *Alphonsea* has both sets saccate. However *Alphonsea* differs from it in the very small sepals not equal in length to the outer petals. From *Orophea*. *Alphonsea* departs in not having the mitriform inner petals but it may have some further affinity with *Platymitra* in respect of the thick, hard walls of the carpels found in both genera.

KEY

a. Leaves pubescent on midrib below. Fruit if present not verrucose

b. Ovaries 8. Reticulations of leaves prominent below
(1) **A. Maingayi**

b. Ovaries 3. Reticulations of leaves very faint below
(2) **A. cylindrica**

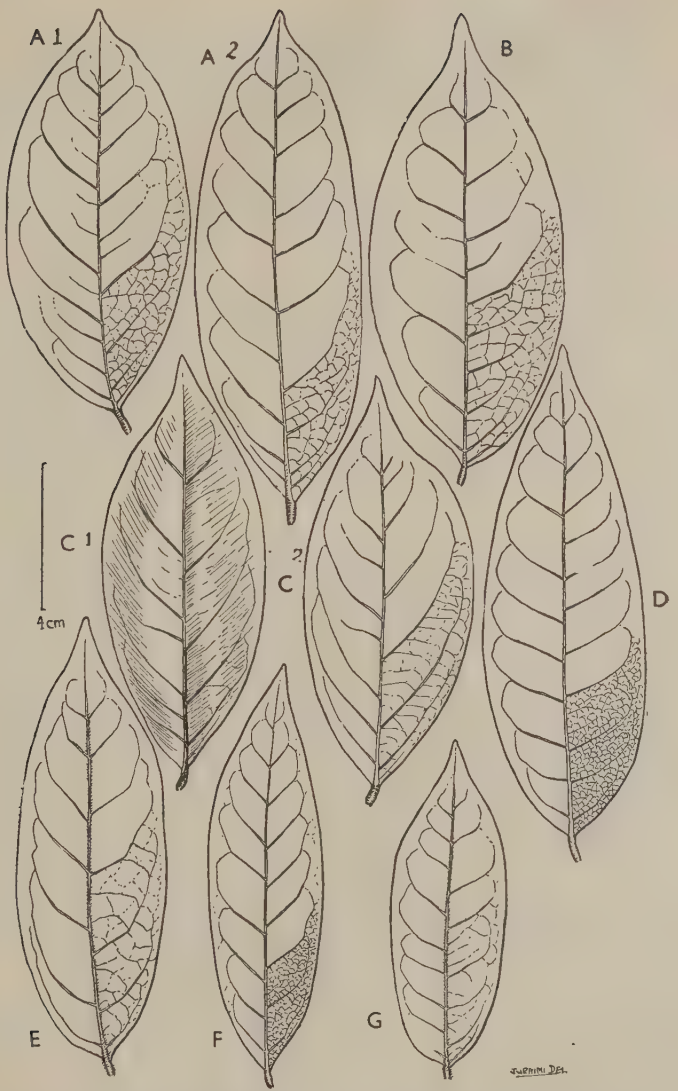


Fig. 29. Leaves of *Alphonsea* sp.

A1 and A2, *A. elliptica*. B, *A. johorensis*. C1 and C2, *A. lucida*, upper and lower surface. D, *A. Curtisii*. E, *A. Maingayi*. F, *A. Kingii*. G, *A. cylindrica*. All drawings except C1 show lower surface of leaf.

a. Leaves glabrous. Fruit verrucose

c. Reticulations on lower surface of leaf forming a very close network (3) **A. Kingii**

c. Reticulations on lower surface of leaf forming a loose network (4) **A. johorensis**

a. Leaves glabrous. Fruit not verrucose

d. Veins depressed above, prominent beneath (fruit unknown) (5) **A. lucida**

d. Veins not depressed above

e. Leaf drying black. Reticulations forming a loose open network. Ovaries 5–6 (6) **A. elliptica**

e. Leaf not drying black. Reticulations forming a fine close network. Ovaries 3 (7) **A. Curtisii**

(1) **A. Maingayi** Hk. f. et Th. Fl. Br. Ind. 1 (1872) 90; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 374 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 161 Pl. 205B; Ridley, F.M.P. 1 (1922) 98.

Tall tree. *Young twigs* dark brown-pubescent, soon glabrous, dark and striate. *Leaves* slightly coriaceous, oblong or elliptic, acuminate, base acute or rounded and unequal-sided, glossy and glabrous above except the basal part of the midrib, rusty-pubescent below on midrib and nerves; nerves 9–12 on each side of midrib and mostly alternate, curving and interarching 5–7 mm. from the slightly revolute edge, reticulations visible above, raised beneath; length 10–17 cm.; breadth 4–5·5 cm.; petiole 5 mm. long, tomentose. *Flowers* opposite the leaves or slightly below in cymose clusters with 1–3 tomentose peduncles about 5 mm. long and pedicels similar, about 5 mm. long. *Sepals* broadly ovate to sub-orbicular, obtuse, tawny-tomentose outside, glabrous inside, 3 mm. long. *Petals* rather similar in shape and arrangement as those described for *A. elliptica,* having reflexed tips and saccate bases with the concavity below where the pedicel joins the calyx, yellow, tomentose outside and on the exposed reflexed tips, glabrous inside, ovate, about 1·3 cm. long, the inner slightly narrower. *Stamens* numerous, miliusoid. *Ovaries* 8, cylindrical, tomentose 3 mm. long; stigma glabrous. *Ripe carpels*, oblong or cylindrical, obtuse at both ends, tawny-tomentose, 1–2·5 cm. long; stalks about 5 mm. long. *Seeds* many, smooth.

PERAK: Lumut, no collector stated, *July 1858* (S.).

SELANGOR: Weld Hill, *Burn-Murdoch 41* (S.); *Ahmad C.F. 2497* (K.); *Hamid C.F. 806, tree no. 64* (K.); *Hashim 471* (K., Kew) and *41* (K.).

NEGRI SEMBILAN: Sungei Menyala F.R., Port Dickson, *Wyatt-Smith. 64833* and *64560* (K.); Senawang Reserve, *Yahim C.F. 528* (S., K., Kew).

MALACCA: *Maingay 98* (C., Kew) type material.

JOHORE: 7th mile, Jalan Mersing, *Holttum S.F.N. 9288* (S., Kew).

SINGAPORE: Chan Chu Kang, *Ridley 6758* (S.); Gardens' Jungle. *Ridley 12194* (Kew).

DISTRIBUTION: Malay Peninsula.

(2) **A. cylindrica** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 376 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 164 Pl. 211B; Ridley. F.M.P. 1 (1922) 99.

Synonym: A. pallescens Craib in Kew Bull. (1925) 14.

Tree 7–13 m. high. Tips of young branches hirsute with hairs up to 1 mm. long, soon glabrous and striate. *Leaves* elliptic or elliptic-lanceolate, shortly and bluntly acuminate, base sub-cuneate, occasionally slightly rounded, rather rigid, glabrous except the midrib above and below, margins sometimes slightly revolute: nerves about 10 pairs not or scarcely visible above, faint below, interarching 2–3 mm. from margin; reticulations not visible above, very faint below; length 6·5–9·5 cm.; breadth 3–4 cm.; petiole 4 mm. long, hirsute. *Peduncle* extra-axillary, opposite the leaves, 3–5 mm. long, pubescent, pedicels about 5 mm. long. *Flowers* about 1 cm. long (very few flowers, mostly flower buds available). *Sepals* semi-orbicular, connate at base, tomentose outside, glabrous inside, reflexed when flower is open, 1·5 mm. long. *Petals* subequal, oblong-ovoid, base sub-saccate, tomentose outside, pubescent inside except the glabrous base, apices not appearing reflexed as in the other species (flowers examined, rather young). *Stamens* 1 mm. long with a short apiculus. *Young ovaries* 3, oblong, densely pale-sericeous, 4 mm. long, stigma sessile, with opening down inner side; ovules several in two rows. *Ripe carpels* oblong, rounded at each end, minutely tawny-pubescent, thick-walled, 5–5·5 cm. long and 3·2–3·7 cm. in diameter.

KEDAH: Perangin F.R., *Awang 20678* (K.).

PERAK: Ulu Bubong, *King 10633* (S., C., D.D., Kew), type material: Dindings, road from Bruas to Sungei Rotan, *Curtis, February 1900* (S.); Kinta, *King 7100* (C.); Bikun Reserve, Sungkai, *Hashim 375* (K., Kew).

SELANGOR: Bukit Enggang F.R., Kajang, *Symington 24126* (S., K.).

DISTRIBUTION: Malay Peninsula and Siam.

The carpels in the type material and in *Symington 24126* are galled and are similar to the galled fruit found in *Goniothalamus Macranii*. They are elongate, terete, tapering at the apex, slightly curved, brown-tomentose on stalks 2 mm. long. The normal ones are oblong and rounded at each end.

(3) **A. Kingii** J. Sinclair, **sp. nov.**

Synonym: Xylopia dicarpa King quoad specimen *King 7097* tantum, in Mat. F.M.P. Vol. 1 No. 4 (1892) 363 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) Pl. 189A (plate only); Ridley, F.M.P. 1 (1922) 91 non *Xylopia dicarpa* Hk. f. et Th. (1872).

Arbor parva, 6–8 m. alta. *Folia* 8·5–12 cm. longa, 3·5–4 cm. lata, mediocre-viridia, tenuiter coriacea, elliptico-lanceolata, paullo falcata, glabra, utrinque acuta; nervi primarii 8–10 pares utrinque obscuri; reticulationes tenuissimae, densissimae dispositae; petioli 5 mm. longi. *Carpella* matura 1–5, cylindrica, medio leviter vel non constricta, verrucosissima, apice obtusa, 3–4·5 cm. longa et 1·5–2 cm. lata; stipites 1 cm. longi. *Semina* 7–8 in series duas disposita, compressa, cum testa pallida squamosa.

PERAK: Kinta, *King 7097* (C., D.D., Kew) holotype; Perak, *Scortechini*, no number or date, wrongly determined as *Polyalthia aberrans* (S.).

DISTRIBUTION: No other records.

A rare species with cylindrical, very verrucose carpels. The very close reticulations of the leaves too are a good guide to identification. There is a tiny flower bud on the *Scortechini* specimen.

A. Kingii is not found in Singapore and is not the same as Maingay's *Xylopia dicarpa* which is a synonym of *X. malayana*. There are two sheets of *Maingay 84* in Herb. Kew, locality Singapore. One is the type of *Xylopia dicarpa* and bears also the writing *X. malayana*. The other bears only the writing *X. malayana* but both are *X. malayana*. King's plate 189A in Ann. Roy. Bot. Gard. Calc. 4 (1893) is good one of *Alphonsea Kingii* but it is labelled *X. dicarpa*.

(4) **A. johorensis** J. Sinclair, **sp. nov.**

Folia eis *A. ellipticae* similia sed minora, magis acuminata et in sicco brunnea non nigra; fructus verrucosus.

Arbor monopodialis, 20 m. alta, cortice nigro-grisea, praeter inflorescentiam omnino glabra. *Folia* 6–12 cm. longa, 2·5–5 cm. lata, sub-coriacea, nitida, fusco-viridia, in sicco brunnea, elliptica vel oblongo-elliptica, apice acuminato-obtusa, basi acuta; nervi c. 10 pares, tenues, supra obscuri, subtus visibiles, obliqui, irregulariter curvati, duplo anastomosantes; reticulationes supra fere obscurae, subtus laxe dispositae; *petioli* 5 mm.–1 cm. longi. *Pedunculus* brevissimus, 2–3 mm. longus, extra-axillaris, foliis oppositus, senectute lignosus, 3–4 bracteas minutas utrinsecus ferens. *Pedicelli* brevissimi, 2–3 mm. longi, fulvo-tomentosi, crassiusculi.

Sepala 1 mm. longa, late ovata vel subrotunda, obtusa, extus fulvo-tomentosa, intus glabra. *Petala* 5–8 mm. longa, virido-alba, ovato-oblonga, apice sub-acuta vel obtusa et leviter reflexa, basi saccata, extus fulvo-tomentosa, intus in apicibus expositis puberula; interiora consimilia sed paullo angustiora. *Stamina* 1 mm. longa in series tres disposita, cum connectivis perspicue productis. *Ovaria* 7, 2·5 mm. longa, cylindrica, fulvo-setosa; stigma sessilia U-formata cum fissura adaxiali; ovula plura in series duas disposita. *Carpella* probabiliter non matura fulvo-tomentosa, globosa vel oblonga, verrucosissima, 1·5 cm. longa, 1 cm. lata cum pericarpio crasso; stipites 5–7 mm. longi.

JOHORE: Sungei Kayu, *Kiah S.F.N. 32139* holotype (S., E.); *Corner S.F.N. 30864* (S.); Sungei Berassau, Mawai-Jemaluang Road, *Corner S.F.N. 29934* (S., K.); S. Kayu Ara, *Corner S.F.N. 29375* (S., K., Kew).

DISTRIBUTION: Only known so far from the above localities.

A rare species. It is possible that the carpels have not reached their full dimensions in the material examined. The leaves in dried specimens are a medium brown and not black like *A. elliptica*.

(5) **A. lucida** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 375 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 163 Pl. 212; Ridley, F.M.P. 1 (1922) 98.

Shrub 2–3 m. high. All parts glabrous except flower. *Young twigs* slender and dark coloured. *Leaves* thinly coriaceous, broadly elliptic, shortly, abruptly and rather obtusely acuminate, base cuneate; main nerves 7–8 pairs, oblique, curving, depressed on upper surface, bold and prominent on lower; reticulations faint above, more marked below; length 11·5–14 cm.; breadth 4·5–6·5 cm.; petiole 7 mm. long. *Flowers* extra-axillary, 2–3 in fascicles; peduncles short, pedicels shorter, puberulous 7–10 mm. long. *Sepals* triangular-ovate, connate at base, reflexed, puberulous outside, glabrous inside. *Petals* yellowish-white, sub-equal, (the inner narrower) the base saccate and the tips reflexed as in *A. elliptica* and *A. Maingayi,* pubescent outside, glabrous inside, thin in texture, about 1·2 cm. long. *Stamens* several, miliusoid, i.e. connective with short apiculus not concealing anther cells. *Ovaries* 4–5 adpressed-tawny-pubescent, cylindrical 2 mm. long with several ovules in two rows; stigmas sessile, horse-shoe-shaped on top with slit down the inner side. *Ripe carpels* unknown.

PERAK: Larut, *King 5387* (C., D.D., Kew) type material.
PAHANG: Ulu Baloh, *Awang 29602* (K.).
DISTRIBUTION: Malay Peninsula.

A very rare species, the fruit of which is as yet unknown. Apart from *King 7119* and *7516* also type material, quoted in Ann. Roy. Bot. Gard. Calc. p. 164, which I have not seen, the numbers quoted here are the only records of this species. It is desirable that more information should be gained about it. There is no specimen in the Singapore Herbarium at the time of writing.

(6) **A. elliptica** Hk. f. et Th. Fl. Br. Ind. 1 (1872) 90; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 374 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 163 Pl. 211A; Craib, Fl. Siam. Enum. 1 (1925) 62; Corner, Wayside Trees of Malaya (1940) 128 Text-fig. 31 and Pl. 221.

Synonym: A. Maingayi var. *elliptica* Ridley, F.M.P. 1 (1922) 98.

Tree up to 25 m. with dense, bushy, conical crown, trunk fluted at base, bark dark grey, slightly fissured. *Young twigs* glabrous, coarsely striate and angled. *Leaves* coriaceous, glabrous, glossy, dark green, metallic greyish-black when dry, margins slightly revolute, elliptic, less often broadly oblong, apex shortly acuminate but the tip blunt, base acute; nerves 7–11 pairs, fine and slender but visible on both surfaces, rather crooked, interarching some distance from the margin; reticulations faint above, distinct below; length 9–18 cm.; breadth 3·5–7 cm.; petiole glabrous, ringed, 4–5 mm. long. *Flowers* sweet-scented, (like *Cananga*) pale greenish-cream, drooping, extra-axillary. *Peduncles* short, 3–5 mm. long, 1-several arising from one point, lengthening and becoming woody, multi-bracteate. *Pedicels* slender, 1–1·5 cm. long, pubescent with a median, minute bracteole. *Sepals* very small in proportion to the petals, 1 mm. long, sub-orbicular, obtuse, tomentose outside, recurved when flower is open. *Petals,* both sets saccate at base, there being a circular cavity 3–4 mm. deep where pedicel meets calyx, apices bluntly acute and strongly recurved, subequal in length, about 2 cm. long when flattened and the inner slightly narrower, adpressed-pubescent outside, glabrous inside except the exposed tips. *Stamens* many, just over 1 mm. in length, filaments about half the length of the anthers, connectives produced but not concealing the anthers. *Ovaries* 2·5 mm. long, oblong, shortly tomentose, 5–6; stigma sessile, sub-capitate and horse-shoe-shaped on the top having a slit down the inner adaxial side. *Torus* conical. *Ripe carpels* 2–6, oblong, blunt at each end, minutely tomentose, 4–7·5 cm. long and 2·5–5 cm. broad, green, then yellow with an

edible pulp; stalks 1·2–2·5 cm. long. *Seeds* 6–7 in 2 rows, flattened, pale brown.

TRENGGANU: Kuala Trengganu, *Corner S.F.N. 33475* (S., Kew); *Holttum S.F.N. 15167* (S., Kew); *Sinclair S.F.N. 39820* (S.).

PAHANG: Permatang Lima, *District Forest Officer 15640* (S., K.); Berserah Road, Kuantan, *Yeob C.F. Field No. 3644* (S., K., Kew); Kuantan, *Sow 15136* (S., K.); Menchali Road, Rompin, *Yeob 3256* (S., K.); Kemansul Reserve, *For. Dept. 14085* (S., K.); Joara Bay, Pulau Tioman, *Burkill S.F.N. 1001* (S., C., Kew).

SELANGOR: Weld Hill, *Abdul Rahman C.F. 2832* (K.) and Forest Dept. *C.F. 0347* (S., K.).

NEGRI SEMBILAN: Sungei Menyala F.R., Port Dickson, *Wyatt-Smith 64798* (K.).

MALACCA: *Maingay 107* (C., Kew) and *99* (Kew) type material.

DISTRIBUTION: Siam and Malay Peninsula.

(7) **A. Curtisii** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 376 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 166 Pl. 215B; Ridley, F.M.P. 1 (1922) 99.

Tree. *Young twigs* shortly pubescent, soon glabrous and striate. *Leaves* coriaceous, elliptic or oblong-lanceolate, apex acute, base acute, glossy and glabrous on upper surface, glabrous beneath except for the slightly puberulous midrib, margins slightly revolute; main nerves 12–15, faint on both surfaces, sub-horizontal; reticulations very close and fine on both surfaces; length 9–15 cm.; breadth 3·5–4·5 cm.; petiole 5 mm. long. *Peduncles* extra-axillary, opposite the leaves, 4–5 mm. long, bearing 3–4 tawny-tomentose pedicels 5 mm. long, each with a minute amplexicaul, median bract. *Flowers* about 1·2 cm. long. *Sepals* ovate-triangular, acute, tawny-tomentose outside, glabrous inside and slightly reflexed when flower is open. *Petals* of the same general form and arrangement as in *A. elliptica* and *A. Maingayi* with saccate base and concavity and reflexed tips; oblong-ovate, sub-acute, sub-equal, the inner narrower, the outer tawny-pubescent on both surfaces except at the base, the inner also tawny-pubescent but glabrous inside. *Stamens* numerous, 1 mm. long, connective with a small apical process concealing the dorsal anther cells. *Ovaries* 3, oblong, tomentose, 3 mm. long with broad sessile stigmas. *Ripe carpels* 2–3, oblong, with uneven surface in the dried material, obtuse with hard, thick walls, length 4–5 cm. and diameter 3 cm.; stalks 5 mm. long and 4 mm. thick. *Seeds* several in two rows.

PENANG: Muka Head, *Curtis 1410* (S., C., Kew) type material; Pulau Boetong Reserve, *Curtis 2746* (S.).

PAHANG: Pahang River, *Ridley 2423,* (fruiting specimen) (S.).

DISTRIBUTION: These are the only collections.

30. OROPHEA Blume, Bijdr. 1 (1825) 18.

Shrubs or small trees. *Flowers* small, usually between 4 mm. and 2 cm. in diam., hermaphrodite, supra-axillary or axillary. *Peduncles* slender, bearing 1-several pedicels. *Inflorescence* cymose or fascicled. *Sepals* 3, valvate, smaller than the outer petals. *Petals* 6, valvate; the *outer* ovate, shorter than the inner; the *inner* with narrow claws, the limbs broader, usually cohering by their margins into a mitriform cap (vaulted) or sometimes not, the apices then being free. *Stamens* definite, 6–12 miliusoid, i.e. resembling those of *Miliusa,* the dorsal anther cells not obscured at their tips by the connective; connective slightly prolonged beyond them in a conical point or not, never truncate. *Staminodes* 0 or 3–6. *Ovaries* 3–5; stigma sessile, slightly elongate or rod-shaped and bent to one side. *Ripe carpels* 1-several-seeded, globose or elongate.

SYNTYPES OF GENUS: *O. hexandra* Bl. Bijdr. 1 (1825) 18. *O. enneandra* Bl. Bijdr. 1 (1825) 18.

DISTRIBUTION: Eastern Asia, Malay Islands and Philippines. About 60 species.

Hutchinson, [Kew Bull. (1923) 206] without any reasons gives *O. zeylanica* Hk. f. et Th. as the type of the genus although the above two species are published under Blume's original description of the genus.

The genus itself is easily recognized but the separation of individual members presents some difficulty as many of them closely resemble each other. In the genus there are to be found two types of carpels—the globose as in *O. polycarpa, gracilis, hastata, zeylanica, dodecandra* and *palawanensis* and the elongated, often moniliform type exemplified by *O. hexandra, maculata, enterocarpa and cuneiformis.* These distinguishing characters of the carpels are not co-related with other varying ones.

Orophea is related to *Mitrephora* and *Pseuduvaria* as well as to the *Miliuseae* and a table of differences is here given. In fact it seems to be a link connecting the two tribes *Mitrephoreae* and *Miliuseae.*

Burkill S.F.N. 12488, South of Lawin, upper Perak (S.), *Kiah s.n. 7th May, 1938,* Gunong Baling, Kedah (S.) and *Scortechini 106b,* Perak (D.D.) all represent a species of *Orophea* not mentioned in Ridley's Flora. It is probably new but the material at present is too scanty to describe as good flowers are lacking.

The carpels, 1–2 in number, are sessile and oblong-cylindric with several seeds in two rows. The leaves, up to 20 cm. in length, are glabrous with 9–10 pairs of veins.

	Mitrephora	Pseuduvaria	Orophea
Flowers			
1. Position	Extra-axillary	Axillary	Supra-axillary or axillary
2. Size	Large, average 2–4 cm. diam.	Small, average under 2 cm.	Small, average under 2 cm.
3. Sex	Hermaphrodite	Unisexual	Hermaphrodite
4. Proportion of length of outer petals to inner	Outer petals longer than inner	Outer petals shorter than inner	Outer petals shorter than inner
Stamens	Uvarioid, numerous	Uvarioid, numerous	Miliusoid, few
Carpels	Globose or oblong, never narrow or elongate	Globose	Globose or narrow and elongate
Stigma	Sub-capitate, discoid	Sessile, sub-capitate, fleshy, discoid	Sessile, slightly elongate or rod-shaped, bent not erect

KEY

a. Fruit elongate, cylindric, inner petals distinctly vaulted, the limbs coherent by their edges

b. Leaves glabrous, ripe carpels glabrous (1) **O. enterocarpa**

b. Leaves pubescent, ripe carpels thinly pubescent

c. Flower buds acute, outer petals about 1 cm. long, inner 1·5–2·5 cm. long; leaves abruptly narrowed from middle to base (2) **O. maculata**

c. Flower buds globose, outer petals about 3 mm. long, inner 7 mm. long; leaves not abruptly narrowed from middle to base (3) **O. cuneiformis**

a. Fruit globose, inner petals vaulted, scarcely vaulted or not
  d. Stamens 6
    e. Inner petals vaulted. Leaves rusty-hirsute below
      (4) **O. hirsuta**
    e. Inner petals slightly vaulted. Leaves glabrous below.
      (5) **O. polycarpa**
  d. Stamens 10–12 (Inner petals not vaulted)
    f. Limb of inner petals hastate, smooth, not recurved, stalks of ripe carpels 7 mm. long (6) **O. hastata**
    f. Limb of inner petals linear, smooth, recurved, stalks of ripe carpels 2–2·3 cm. long (7) **O. dodecandra**
    f. Limb of inner petals oblong, very papillose, recurved, stalks of ripe carpels 1·3–1·5 cm. long
      (8) **O. palawanensis**

(1) **O. enterocarpa** Maingay ex Hk. f. et Th. Fl. Br. Ind. 1 (1872) 92; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 331 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 106 Pl. 148A; Ridley, F.M.P. 1 (1922) 70.

Small tree or shrub 2–10 m. high. All parts glabrous except the inflorescence. *Young twigs* slender, dark, striate. *Leaves* dark glossy green above, medium green beneath, membranous, variable in size and shape on the same twig, ovate to elliptic or obovate-lanceolate, apex acute or acuminate, base acute, sometimes slightly rounded; nerves 6–7 pairs, prominent beneath, less distinct above, arching and following the margin some distance before anastomosing; reticulations very fine and faint; length 6–12 cm.; breadth 3–5 cm.; petiole ringed, 3 mm. long. *Peduncles* slender, slightly pubescent; supra-axillary, occasionally axillary, 5 mm.–1 cm. long, 1-3-flowered; pedicels 1–3 cm. long with a basal and a medial, linear bract 2 mm. long. *Flower buds* acute with one flower opening at a time. *Sepals* ovate, acute, adpressed-pubescent outside, 3 mm. long. *Outer petals* thin, ovate, acute, several-veined, not clawed, puberulous, cream-coloured, 1–1·5 cm. long; inner slightly longer, coriaceous, cream-coloured, reddish-purple outside and inside at the base of the blade, the claw very narrow, yellow, the blade trapezoid. *Staminodes* 6. *Stamens* 6–12 with broad, non-apiculate connectives. *Ovaries* 6, cylindric, 1 mm. long, pubescent, 2–7 ovuled; stigma small, sessile. *Carpels* 4–6, glabrous, elongate-cylindric, shrinking a good deal when dry, the walls closely adhering to the seeds, 7–13 cm. long, and 4 mm. broad; stalks thick, about 7 mm. long. *Seeds* elongate, 1·8–2 cm. long.

KELANTAN: Sungei Keteh, Gua Ninik, *Nur S.F.N. 12128* (S., K., Kew); Gua Panjang at Gua Ninik, *Henderson S.F.N. 19516* (S.); Gua Musang, *Henderson S.F.N. 22699* (S.).

PERAK: Larut, *King 7462* (S., C., Kew) and *7695* (S., C.); Kuala Kangsar, *Martin 8302* (K.); Taiping, *King 8397* (C., D.D., E., Kew); no exact locality, *Scortechini 2189* (S., C., D.D.).

TRENGGANU: Compt. 11A, Bukit Bauk F.R., 52½ ml. Dungun-Paka Road, *Sinclair S.F.N. 39897* (S.).

PAHANG: Ulu Gali, Raub, *Kalong 20276* (S., K.); Jerantut, *Holttum S.F.N. 24753* (S.); Sungei Nering, Temerloh, *Henderson F.M.S. Museums Herbarium 10712* and *10716* (S.); Bukit Chintamani, Bentong, *Henderson S.F.N. 25040* (S.); Tahan River, *Mat, 22nd September, 1893* (S.).

SELANGOR: Enggang F.R., Kajang, *Symington 24174* (K.); *Batu* Caves, *Ridley 13387* (S., Kew); Ginting Simpah, *Hume F.M.S. Museums Herb. 8745* (S.).

NEGRI SEMBILAN: Gemas, *Burkill S.F.N. 6389* (S., K.).

MALACCA: *Alvins, 4th October, 1885 sine num.* (S.); *Maingay 88* (C.); *Maingay 89* (Kew) type material.

JOHORE: Sungei Kayu, *Kiah S.F.N. 32058* (S., K., Kew).

DISTRIBUTION: Siam.

(2) **O. maculata** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 331 et in Ann. Roy. Bot. Gard Calc. 4 (1893) 106 Pl. 148B; Ridley, F.M.P. 1 (1922) 71.

Shrub 3–7 m. high. *Young twigs* rusty-tomentose, later dark and striate. *Leaves* membranous, elliptic-oblanceolate, narrowed from the middle to the emarginate, slightly unequal-sided base, glabrous above, rusty-pubescent on the midrib and nerves beneath, apex acuminate; main nerves 10–12 pairs, faint above, prominent below, oblique and anastomosing near margin; reticulations faint above, more distinct below; length 8–18 cm.; breadth 4–5·5 cm.; petiole 3 mm. long, ringed and rusty-tomentose. *Peduncles* supra-axillary, sometimes axillary, slender, pubescent, 2-3-flowered, 1·5 cm. long; *pedicels* similar but only 5 mm. long with filiform rusty-pubescent bracts and a similar one near base of calyx. *Calyx* and *corolla* segments all membranous and pubescent on both surfaces. *Sepals* linear, acuminate, 2·5 mm. long. *Outer petals* ovate, acuminate, 4-veined, cream-coloured, mottled with red, about 1 cm. long; *inner* 1·5–2·5 cm. long with lanceolate, acuminate, pink limb and long, narrow, yellow claw. *Stamens* 6, not apiculate, hairy at the base; *staminodes* 3, orbicular. *Ovaries* 3–6 cylindrical, very hirsute, 6–7 ovuled; stigma sessile. *Carpels* elongate-cylindric, moniliform as in *O. enterocarpa* but pubescent. *Seeds* also similar.

PAHANG: Jerantut, *Holttum S.F.N. 24749* (S., K.); Bukit Cheras, *Henderson S.F.N. 25217* (S., C.); Base of Kota Glanggi, *Henderson S.F.N. 22485* (S.) and *Ridley 2428* (S.); Pulau Chengei, *Ridley 2632* (S.).

PERAK: Kuala Depang, *Ridley 9621* (S., Kew) and *Curtis 3113* (S., Kew); Gunong Lanoh near B. Gajah, *Mills* and *Henderson S.F.N. 15076* (S.); Ipoh-Gopeng Road, 4th mile, *Burkill S.F.N. 6270* (S., K., Kew); Bubu Forest Reserve, *Tachun 29853* (S., K.); Gunong Tungal, *Ridley, March 1896;* Perak, *Scortechini 1771* (S., C.) type material; *106b* (C.) type material; Gopeng, *King* Nos. *4578* (S., C., D.D., Kew); *484* (S., C., D.D., Kew); *5874* (C., Kew); Larut, *King 7652* (C., D.D., Kew); and *Wray 2469* (S., C.); King's numbers type material.

SELANGOR: Bukit Batu, Kanching, *Henderson 43281* (K.).

The distribution does not appear to be as wide as that of *O. enterocarpa* but in both cases there is a preference for thick woods with a limestone substratum. This species resembles *O. enterocarpa* but has pubescent fruit, the leaves have more veins and are rusty-pubescent on the midrib and veins beneath and never glabrous. The young twigs are rusty-tomentose. There are also some minor differences in the flower—the inner petals are membranous and not thick as in *O. enterocarpa.*

(3) **O. cuneiformis** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 333 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 108 Pl. 150B; Ridley, F.M.P. 1 (1922) 72.

Tree or shrub 7–13 m. high. *Young twigs* rusty-tomentose, later glabrous, dark and striate. *Leaves* as in *O. maculata* but usually less acuminate and slightly firmer in texture and less abruptly narrowed from the middle to the base. *Peduncles* 4-5-flowered, supra-axillary or sometimes axillary, about 1·2 cm. long, rusty-pubescent as are the 3–5 mm. long pedicels. *Bracts* as in *O. maculata. Flower buds* globose. *Calyx* and *corolla* pubescent outside but glabrescent or glabrous inside. *Sepals* ovate, acuminate, 2 mm. long. *Outer petals* ovate, acute, membranous, 5-veined, 3 mm. long; inner about 7 mm. long with a cuneiform, thickened limb and narrow claw. *Stamens* 6 with broad, flat connectives not produced at apex. *Staminodes* 3, sub-orbicular, fleshy. *Ovaries* about 6, oblong, densely pubescent, 2–3 ovuled; *stigma* sessile, broad. *Ripe carpels* 2–4, sessile, cylindric, tapering a little at each end, puberulous, 3·5–5 cm. long and about 7 mm. in diam. *Seeds* 2, oblong.

LOWER SIAM: Bukit Rajah Wang, Setul, *Ridley 15342* (S., Kew); Gunong Texai, Tongkah, *Curtis 2929* (S., C.).

PERAK: *Scortechini 1584* (S., C., D.D.); *101b* (S.); *1754* (S., C.); Gopeng, *King 551* (S., C., Kew); *5832* (C., D.D., E.); *4568* (C., D.D., E., Kew); Kuala Depang *8250* (C., Kew); *8234* (C., Kew); Larut, *King 2869* (C., Kew); Kampong Kota, *Wray 3338* (S., C.); Gunong Pondok, *Haniff S.F.N. 10335* (S., K.); Chenderoh F.R., *Ja'amat 39206* (S., K.). Scortechini and King's numbers type material.

DISTRIBUTION: Siam.

A limestone species. Very close to *O. maculata* but distinguished from it by the globular flower buds, the much smaller flowers and the cuneiform limb of the inner petals. The leaves are very similar but slight differences are given in the description. Wray reports the colour of the flower to be pink. I have not seen fresh material. The description of the fruit is taken from King. The carpels are smaller and fewer-seeded than in *O. maculata.*

(4) **O. hirsuta** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 330 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 104 Pl. 146A; Ridley, F.M.P. 1 (1922) 70.

Shrub 3–4 m. high. *Young twigs* densely covered with erect, rusty-brown, 1 mm. long hairs, later becoming glabrous. *Leaves* elliptic, often slightly obovate, bright green, glossy and glabrous above, rusty-hirsute on the margins and beneath on the midrib and veins, apex shortly and bluntly acuminate, base rounded, emarginate and unequal-sided; nerves 8–9 pairs, arching and anastomosing 2–3 mm. from margin, faint on both sides; reticulations also faint; length 6–8 cm.; breadth 2·8–3·8 cm.; petiole very short, 2 mm. long. *Peduncles* very slender, rusty-hirsute, supra-axillary or sometimes axillary, about 1 cm. long. *Pedicels* 4–5 mm. long with several minute bracteoles. *Flowers* 1·2 cm. in diam. *Sepals* broadly ovate, acute, hirsute outside, glabrous inside, 1 mm. long. *Outer petals* broadly ovate, blunt, sparsely pubescent outside and on the edges, glabrous inside, 3 mm. long; *inner petals* 7 mm. long, vaulted, limb trapeziform, rather thick, glabrous outside, pubescent inside, the claw very narrow, longer than the limb. *Stamens* 6 in a single row, curved, with broad dorsal anthers, not concealed by the connectives. *Ovaries* about 6, ovoid, glabrous, 1-2-ovuled with sessile stigma. *Carpels* 4–5 globular, dark-brown when dry, thin-walled, sparsely hirsute, 1 cm. in diam.; stalks 2 mm. long.

PERLIS: Kaki Bukit, *Kiah S.F.N. 35276* (S., K., Kew).

KEDAH: Gunong Baling, *Kiah S.F.N. 35402* (S., K., Kew).

PERAK: Gopeng, Kinta, *King 4283* type (S., C., Kew); Padang Rengas, *Burkill S.F.N. 13578* (S.).

DISTRIBUTION: Confined to the Malay Peninsula.

A limestone species, little collected. Burkill states on the label of *S.F.N. 13578* that the sepals are rose and the petals green with a rose line outside. King states that the flower is red and lower part white.

(5) **O. polycarpa** A. DC. Mém. Anon. (1832) 39 T. 4; Hk. f. et Th. Fl. Ind. 1 (1855) 111 et in Fl. Br. Ind. 1 (1872) 91 Specimina Andamanica excl.; Craib in Kew Bull. (1915) 434

et in Fl. Siam. Enum. 1 (1925) 60; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 334 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 109 (descr. et tab. excl.).

Synonyms: O. anceps Pierre, Fl. For. Cochinch. (1881) T. 46. *O. undulata* Pierre, Fl. For. Cochinch. (1881) T. 45. *O. polycephala* Pierre, Fl. For. Cochinch. (1881) T. 46. *O. gracilis* King, Mat. F.M.P. Vol. 1 No. 4 (1892) 332 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 107 Pl. 149A; Ridley, F.M.P. 1 (1922) 71.

Slender tree 7–10 m. high, densely covered with leaves. *Young twigs* at first minutely tomentose, soon glabrous and dark coloured. *Leaves* variable in size on the same twig, slightly coriaceous, glabrous, shining, lanceolate, acuminate with an obtuse point, base acute; nerves 5–6 pairs, faint and slightly raised above, prominent below, interarching 3–4 mm. from margin; reticulations visible below; length 5–10 cm.; breadth 2–3·5 cm.; petiole 2 mm. long, ringed. *Peduncles* 2–6 cm. long, supra-axillary or axillary, very slender, glabrous with 3–5 alternate, subulate, pubescent, 1 mm. long bracts; pedicels about 3 mm. long. *Flowers* 1–2, greenish-white, the margins of the inner petals pink. *Sepals* broadly ovate, obtuse, connate at the base, pubescent on the outside and on the edges, 1 mm. long. *Outer petals* ovate, acute, 2–3 mm. long, several-veined, both surfaces glabrous, edges pubescent; *inner petals* 4–5 mm. long, slightly vaulted, limb thick, deltoid with pubescent edges, claw narrow, not so long as limb. *Stamens* 6, the connectives produced above the dorsal anther cells. *Ovaries* 12, oblong, glabrous with a short, thick, slightly bent style; ovules 2. *Ripe carpels* globose, glabrous, dark brown when dry, 1–1·5 cm. in diam.; stalks 5 mm. long. *Seeds* 1–2 with a transverse groove.

Lower Siam: Pungah, *Haniff* and *Nur S.F.N. 3939* (S., K.).

Perlis: Kaki Bukit, *Kiah S.F.N. 35228* (S., K., Kew).

Perak: *King 8257* (K.); Gunong Kerbau, *Haniff 14737* (S., Kew) and *16312* (S., Kew); Gopeng, *King 5851* (S., C., D.D., Kew) and *4340* (S., C., Kew); Ipoh, *Burkill S.F.N. 2557* (S.); Perak, *Scortechini 167* and *164b* (C.).

Pahang: Kota Glanggi, *Henderson S.F.N. 22443* (S., Kew); *Ridley 2649* (S.).

Distribution: Siam, Burma, Indo-China.

A limestone species. Craib explains how this species was confused with *O. monosperma* [Craib Fl. Siam. Enun. 1 (1925) 61]. In King's monograph [Ann. Roy. Bot. Gard. Calc. 4 (1893) 109 Pl. 151A] the plate and description are those of *O. monosperma* and not *O. polycarpa*. I reduce his *gracilis* to *polycarpa*.

(6) **O. hastata** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 332 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 107 Pl. 149B; Ridley, F.M.P. 1 (1922) 71.

Tree 7–13 m. high. All parts glabrous except the inflorescence. *Young twigs* dark coloured and striate. *Leaves* coriaceous, shining, brown above and pale below in the dry state, elliptic to elliptic-oblong, shortly acuminate, base cuneate; main nerves 6–8 pairs, slightly raised above, very distinct below, curving and at times slightly crooked, interarching near the margin; reticulations visible on both surfaces; length 9–14 cm.; breadth 4–6 cm.; petiole stout, ringed, 4–5 mm. long. *Peduncles* supra-axillary or axillary, 5–6 mm. long with 3–4 uni-bracteolate pedicels near apex. *Flowers* 1 cm. long. *Sepals* broadly ovate, acute, pubescent outside, glabrous inside as are the outer petals. *Outer petals* twice as long as the sepals, broadly ovate, acute. *Inner petals* 8–9 mm. long, the limb hastate, triquetrous, thickened with ciliate edges and base, the claw half as long, glabrous. *Staminodes* 0. *Stamens* 10 in 2 rows, curved, slightly apiculate, the anther cells prominent. *Ovaries* about 10, obliquely oblong, curved, pubescent, 2-ovuled; stigma small, capitate, sessile. *Ripe carpels* 5–6, globular, glabrous, dark brown in the dry condition, 1 cm. in diam., stalks 7 mm. long. *Seed* solitary.

PERAK: Upper Perak, *Wray 3697* (S., C.) and *3531* (C.); Larut, *King 7323* (C., Kew); Ulu Kerling, *King 8847* (C.); Ulu Slim, *King Nos. 10682* (C., Kew); *10666* (C., D.D., Kew); *10939* (C.) all type material.

SELANGOR: Bukit Payong Road, Kajang, *Symington 24250* (S., K.).

? SINGAPORE: Bukit Timah, *Ridley 8119* (S.). This may be *O. palawanensis*.

DISTRIBUTION: Confined to Malaya.

(7) **O. dodecandra** Miq. Ann. Mus. Bot. Lugd.-Bat. 2 (1865) 25; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 333 et in Ann. Roy. Bot. Gard. Calc. (1893) 108 Pl. 150A; Ridley, F.M.P. 1 (1922) 72.

Tree 7–13 m. high. *Young twigs* sparsely adpressed-pubescent, later glabrous, dark coloured. *Leaves* slightly coriaceous, elliptic, shortly acuminate, base cuneate, upper surface glabrous, shining, the lower paler with a few scattered, adpressed hairs, becoming glabrous; main nerves 5–6 pairs, faint and slightly raised above, bold beneath, curving and interarching near margin; length 9–14 cm.; breadth 1·8–5·5 cm.; petiole 5 mm. long, stout, ringed. *Peduncles* axillary, about 3–4 mm. long, rusty-pubescent, bearing

several pedicels about 1 cm. long with acute, linear, basal, pubescent bracts and a similar bract below calyx. *Flowers* 1·2 cm. long. *Sepals* ovate, acute, joined at the base, slightly tubercular outside, glabrous inside. *Outer petals* broadly ovate, acuminate, narrowed at the base, 4 mm. long; *inner petals* thick, linear-oblong, blunt, puberulous outside, slightly arched below the middle, the apices divergent and recurved, c. 1 cm. long. *Staminodes* 0. *Stamens* 12 in 2 rows, connectives produced beyond the apices of the dorsal anthers. *Ovaries* 6–8, oblong, curved, oblique, glabrous, 2-ovuled with oblong, sessile stigma. *Ripe carpels* ovoid or slightly obovoid, blunt, glabrous, 2 cm. in diam.; stalks 2–2·3 cm. long. *Seeds* solitary, sub-rotund or oblong with rugose, pale, scaly testa.

PERAK: Near Gunong Bubu, *King 7386* (S., C., Kew); Larut, *King 7667* (C., Kew) and *7451* (C., Kew); Kuala Depang, *King 8246* (C., D.D., Kew); Lumut, Dindings, *Ridley 10287* (S.); Perak, *Scortechini 2186* (C., D.D., E.); *1764* (S., Kew).

DISTRIBUTION: S. Borneo (Korthals).

(8) **O. palawanensis** Elmer in Leaflets of Philippine Botany 5 (1913) 1721.

Small tree 10–16 m. high. *Main branches* divaricate forming an elongate crown above the middle. *Bark* dark with white patches. *Leaves* sub-coriaceous, dark-green above, paler beneath, a rich brown when dry, base cuneate to slightly rounded, apex rounded and then suddenly shortly and bluntly acuminate, glabrous except for a brown, adpressed pubescence on the midrib and nerves beneath; nerves about 10 pairs, distinct above and bold beneath, curving and ascending, interarching near margin; reticulations lax and visible on both surfaces; length 16–24 cm.; breadth 8–9 cm.; petiole 7 mm. long, ringed, grooved on upper side. *Inflorescence* axillary. *Peduncles* 1–3 clustered, branched from below the middle, subtended by olive-pubescent bracts, branchlets divaricate, subtended by similar pubescent bracts, one bract near base of flower, acute, 1 mm. long. *Sepals* triangular, acute, 2 mm. long, rusty-pubescent outside, glabrous inside. *Outer petals* 3–4 mm. long, cordate-ovate, acute, veined, pubescent outside, glabrous inside; *inner petals* thick, greenish, clawed at base, constricted at middle, limb oblong, rounded at apex, much warted and strongly reflexed, about 6 mm.–1 cm. long and 3·5 mm. broad. *Stamens* 12, 1–1·5 mm. long, subsessile, connectives only slightly produced at top. *Ovaries* 12, glabrous, curved with a sessile bilobed stigma. *Ripe carpels* globose, thin-walled, glabrous 1·5–2 cm. in diam.; stalks 1·3–1·5 cm. *Seed* one with pale brown testa.

PAHANG: Gunong Senyum, *Henderson, 30th July, 1929* (S.).

MALACCA: Batang Malacca F.R., *Kiah S.F.N. 37239* (S.); Bukit Klanna, *Alvins 1271* (S.).

DISTRIBUTION: Palawan and Borneo.

The material in the Singapore herbarium agrees very well with *O. palawanensis Elmer Nos. 20752* and *20948* from Borneo and *Edaño 77721* from Palawan. This species has not been previously recorded from Malaya. Its inner petals are intermediate in shape between those of *O. hastata* and *O. dodecandra;* they are broader than in the latter but not quite so long. They are scarcely hastate as in the former. They differ in that they are very papillose and reflexed. Probably *palawanensis* comes nearest to *dodecandra,* both species having 12 stamens. It is also certainly near Ridley's *Mezzettiopsis Creaghii* which is an *Orophea.* I could only find 7 stamens in the following two sheets of *M. Creaghii—Clemens 20245* and *Haviland* and *Hose 13th April, 1895,* Tinkayo. Ridley says stamens about 20 for *Creaghii.*

O. hastata, dodecandra and *palawanensis* are certainly very closely related and may prove to be forms of one variable species.

The dried material of the first two species available for examination was very scanty and poor as regards flowers and fruit. The texture and shape of the leaves are similar in all three and it is not easy to distinguish them by leaves alone. However the leaves of *O. palawanensis* are larger and have about 10 pairs of veins. Those of the other two are more similar but generally *hastata* seems to have 6–8 pairs of veins and *dodecandra* 5–6 pairs.

31. PLATYMITRA Boerl. in Cat. Pl. Phanerogam. Hort. Bog. 1 (1899) 33 et in Icon. Bog. 1 (1899) 179 T. 62.

Tall trees. *Leaves* glabrous with faint nerves. *Flowers* small, fascicled in the axils of fallen leaves. *Sepals* 3, valvate, connate at base forming a three-lobed cup. *Petals* 6, valvate; *exterior set* sessile, ovate, spreading as flower matures; *inner* about same size, narrow and diverging at base but not clawed, cohering in a mitriform fashion over the stamens and carpels. *Stamens* indefinite, 20 or more, miliusoid. *Ovaries* 2–3, ovules about 10 in two rows; stigma sessile, horse-shoe-shaped (slightly bilobed.) *Ripe carpels* large, globose or ovoid, solitary or 2, sessile with a hard, thick wall, many-seeded.

TYPE OF THE GENUS: *P. macrocarpa* Boerl. in Cat. Pl. Ph. Hort. Bog. 1 (1899) 33 et in Icon. Bog. 1 (1899) 179 T. 62.

DISTRIBUTION: *P. macrocarpa* in Java; *P. siamensis* Siam and Malay Peninsula.

P. siamensis Craib in Kew Bull. (1912) 145 et in Fl. Siam. Enum. 1 (1925) 54.

Tall tree. Glabrous except inflorescence. *Bark* of the twigs brown or dark brown, striate and with scattered lenticels. *Leaves* rather stiff, shining above, lanceolate, apex obtuse, base cuneate; nerves about 12 pairs faint and thin on both surfaces, interarching within the margin; length 5–13 cm.; breadth 1·5–2·5 cm.; petiole about 5 mm. long, ringed below and channelled above. *Flowers* in fascicles arising from the axils of fallen leaves. *Buds* flattened, globose, adpressed-pubescent, pedicels 1 cm. long, somewhat thick with a small bract at base and another near apex. *Sepals* 1·5 cm. long, rounded, obtuse, ferrugineous-pilose outside, glabrous inside. *Outer petals* rather thick, ferrugineous-tomentose outside, glabrous inside, about 3 mm. long and 3 mm. broad. *Stamens* about 20, one mm. long with short, apiculate connectives. *Ovaries* 4, tawny-pubescent, 1 mm. long. *Ripe carpels* about 2, sessile, pale brown with thick, stony wall, (recalling those of *Cyathocalyx sumatranus*), 4–7 cm. long and 5 cm. in diam. *Seeds* several in two rows.

SELANGOR: Sungei Lalang, Kajang, *Symington 22768* (S., K.); Bukit Taku, Kanching, *Symington 43776* (K.).

Not mentioned by Ridley and the above are the only Malayan records as yet. Craib says it differs from *P. macrocarpa* in its longer, narrower leaves, cuneate or subobtuse at the base, the thicker pedicels, the anthers and filaments longer and the carpels ovoid. This genus stands close to *Orophea* and *Pseuduvaria*. It resembles the former in the miliusoid stamens, both in the mitriform inner petals and the latter in the horse-shoe-shaped, sessile stigma.

Tribe 5. MITREPHOREAE

Sepals valvate. *Petals* valvate, inner larger or smaller than outer, less often sub-equal, usually dissimilar, concave, connivent, arching over the sexual organs and forming a dome, if free, their edges at first united for a short time, clawed, the claw often long and narrow or vestigial or absent. *Stamens* many, flat-topped or convex (*uvarioid*).

KEY

a. Flowers axillary

b. Flowers unisexual **32. Pseuduvaria**

b. Flowers hermaphrodite

c. Petals sub-equal; stellate hairs present on leaves and young twigs **33. Neo-uvaria**

c. Inner petals much smaller than outer; no stellate hairs **34. Goniothalamus**

a. Flowers extra-axillary

d. Inner petals shorter than outer or equal to them

e. Climbers. Inner petals not clawed **35. Oxymitra**

e. Trees. Inner petals with long narrow claws 1 mm. broad or less **36. Mitrephora**

d. Inner petals longer than outer with a vestigial claw, the edges at first united, later free, apices incurved; sometimes both sets united at base **37. Popowia**

KEY No. 2

a. Petals sub-equal

Young twigs and leaves with stellate hairs; stamens uvarioid; carpels 1-seeded **33. Neo-uvaria**

a. Inner petals shorter than outer

b. Trees. Inner petals clawed

c. Flowers axillary; inner petals coriaceous, connivent into a cone but not vaulted; seeds 1–2 (rarely 4) **34. Goniothalamus**

c. Flowers extra-axillary; inner petals thin, vaulted; seeds several (4–8) in two rows **36. Mitrephora**

b. Climbers. Inner petals not clawed; flowers extra-axillary **35. Oxymitra**

a. Inner petals longer than outer

d. Flowers hermaphrodite; inner petals with a short or rudimentary claw, the edges adhering at first, later free, apices incurved **37. Popowia**

d. Flowers unisexual; inner petals mitriform, the blades united to form a dome, the claws long and narrow **32. Pseuduvaria**

32. **PSEUDUVARIA** Miquel, Fl. Ind. Bat. 1 Part 1 (1858) 32; Merrill in Philipp. Journ. Science 10 (1915) 254.

Shrubs or trees. *Leaves* with well-marked, straight and nearly parallel veins. *Flowers* small, unisexual, solitary or fascicled in the axils of leaves or fallen leaves. *Sepals* 3, valvate, membranous. *Petals* valvate; outer 3 like the sepals but slightly larger; inner larger with narrower, linear claws, the blades usually hastate or

diamond-shaped, united at the top forming a mitriform hood, glands sometimes present on the inner surface of the blades. *Stamens* numerous, very small, cuneate with flat-topped connectives which project over the anther cells at the top. *Ovaries* in male flowers absent. *Female flowers* often with a ring of staminodes; sometimes one or two fertile or reduced stamens (i.e. with 2 pollen sacs only) may be present. *Ovaries* tomentose, slightly elongated and incurved. *Stigma* sessile, sub-capitate with a U-shaped split on top and also a groove on the inner side. *Ripe carpels* densely and minutely tomentose, stalked or sessile, smooth or warted, 1-several seeded.

TYPE OF GENUS: *P. reticulata* (Bl.) Miq. Fl. Ind. Bat. 1 Vol. 1 Part 1 (1858) 33; Merr. in Philipp. Journ. Sc. Bot. Vol. 10 No. 4 (1915) 254.

BASONYM: *Uvaria reticulata* Bl. Fl. Jav. Anon. (1830) 50 T. 24.

SYNONYMS: *Orophea reticulata* Miq. Ann. Mus. Bot. Lugd.-Bat. 2 (1865) 23. *Mitrephora reticulata* Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 77; King Mat. F.M.P. Vol. 1 No. 4 (1892) 336 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 113 Pl. 156A; Boerl. in Icon. Bogor. 1 (1899) 139; Ridley, F.M.P. 1 (1922) 73.

DISTRIBUTION: Burma, Indo-China, Malaya, Malay Islands and Philippines. About 17 species.

This is quite a distinct genus and I agree with Merrill [Philippine Journ. Science 10 (1915) 254] and Airy-Shaw [Kew Bull. (1939) 290] in maintaining it separate form *Mitrephora* to which it has many similarities. It also has affinities with *Orophea* and I have removed one species namely *O. setosa* King and placed it in *Pseuduvaria* since its flowers are unisexual and have all the characters of a typical *Pseuduvaria*. *Pseuduvaria* differs from both *Mitrephora* and *Orophea* in having unisexual flowers but often staminodes are present in female flowers approaching the condition in *Orophea* where there are in some species six stamens and six staminodes in the normal flowers. Both the stamens of *Mitrephora* and *Pseuduvaria* have flat-topped connectives, uvarioid as in most Annonaceae while those of *Orophea* are miliusoid i.e. the anther cells at the top are not hidden by the connective which in the first two projects over them.

Other differences are found in the table on page 391 but one chief difference is that *Pseuduvaria* and *Orophea* have axillary flowers (also supra-axillary in *Orophea*) while *Mitrephora* has extra-axillary flowers. The tops of the inner petals in *Orophea* usually cohere as in *Pseuduvaria* but sometimes they are free.

In this account I give eight species and three varieties while Ridley and King give only three and they place two of them under *Mitrephora* and one under *Orophea*. However one of their species,

Pseuduvaria (*Mitrephora*) *reticulata* is not admitted here and I have no evidence yet that this plant at all occurs in Malaya. I have seen a large number of specimens of true *P. reticulata* (lent to me from the Herbarium Bogoriense) from Java, Borneo and Bali and I have seen nothing in Malaya quite the same.

In the Singapore, Kepong, Calcutta and Siam herbaria I found a very heterogeneous assortment of material labelled both *macrophylla* and *reticulata*. Many of the *macrophylla* sheets with smaller leaves were called *reticulata*. Many sheets named *reticulata* have turned out to be other species. There were several unnamed sheets.

P. rugosa is recorded here for the first time while the following are new species:—*galeata, nervosa, taipingensis, monticola* and *cerina*. The three new varieties are *P. setosa* var. *major; P. macrophylla* vars. *sessilicarpa* and *cymosa*.

The Siamese material of so-called *reticulata, Kerr 7184* is *P. monticola* and the Tenasserim specimens which I have seen in the Dehra Dun Herbarium are *P. rugosa*. It is opportune to make one other new combination here for a New Guinea species.

Pseuduvaria Dielsiana (Lauterb.) J. Sinclair, **comb. nov.**

Basonym: Goniothalamus Dielsianus Lauterb. in Lauterb. u. K. Schum. Nachtr. Fl. D. Schutzgeb. Süds. (1905) 266.

Synonym: Orophea Dielsiana (Lauterb.) Diels in Engler, Bot. Jahrb. (1913) 159.

I have examined the following five sheets sent on loan from the Rijksherbarium, Leiden:—*K. Gjellerup Nos. 34* and *260* from New Guinea; *H. J. Lam Nos. 433* and *492* from Mamberamo River, New Guinea and *v. Lieuwen 911* from Albatros Bivak, New Guinea and the type, *Schlechter 14509* from New Guinea, on loan from Berlin.

KEY No. 1

a. Carpels sessile

b. Leaf margins, midrib and nerves thinly covered with erect 2–3 mm. long hairs, leaf base notched (1) **P. setosa**

b. Leaves more or less glabrous or hairs if present very short and confined to midrib

c. Base of leaf rounded and unequal-sided (2) **P. taipingensis**

c. Base of leaf acute, rarely round but not unequal-sided

d. Leaves 12·5–19 cm. long, carpels few, globose
(3) **P. monticola**

d. Leaves 16–46 cm. long, carpels about 10, obovate
(4) **P. macrophylla** var. **sessilicarpa**

a. Carpels stalked

e. Carpels rough with numerous almost spine-like warts
(5) **P. rugosa**

e. Carpels smooth

f. Leaf margin, midrib and nerves thinly covered with erect 2–3 mm. long hairs (1) **setosa** var. **major**

f. Leaves glabrous or pubescent, the hairs never so long as 2–3 mm., not present on the margins

g. Leaves 9–17 cm. long; inner petals 1·8 cm. long
(6) **P. galeata**

g. Leaves 14–32 cm. long; inner petals about 7 mm. long

h. Flowers 1–2 not cymose; leaf base rounded or acute
(4) **P. macrophylla**

h. Flowers cymose; leaf base rounded
(4) **P. macrophylla** var. **cymosa**

a. Ripe carpels not seen

i. Leaves with 20–21 pairs of nerves and ending in a long acumen, tomentose on midrib and pubescent on the nerves
(7) **P. nervosa**

i. Leaves with 6–8 pairs of nerves, acuminate, entirely glabrous
(8) **P. cerina**

KEY No. 2

a. Flowers numerous, fascicled (5) **P. rugosa**

a. Flowers 1–2 or cymose

b. Flowers large, inner petals 1·8 cm. long (6) **P. galeata**

b. Flowers about 3 times smaller, inner petals 4–8 mm. long

c. Nerves 6–8 pairs (8) **P. cerina**

c. Nerves usually not less than 12

d. Leaf margins, midrib and nerves thinly covered with erect 2–3 mm. long hairs

e. Carpels sessile; leaves 11–16 cm. long
(1) **P. setosa**

e. Carpels stalked; leaves up to 22 cm. long
(1) **P. setosa** var. **major**

d. Leaves glabrous or pubescent but margins never setose-hairy and hairs less than 2–3 mm. long

e. Leaves densely pubescent beneath, the caudate tip 3 cm. long or more; nerves 20–21 pairs, midrib tomentose below (7) **P. nervosa**

e. Leaves never densely pubescent beneath, if acuminate the tip never longer than 2 cm.; nerves 12–24 pairs; midrib glabrous (tomentose in some forms of *macrophylla*)

f. Mountain plants, elevation 4,000–5,000 ft.; leaves 10–18 cm. long, nerves 12–13 pairs; carpels sessile or nearly so

g. Base of leaf rounded and unequal-sided, petiole 3 mm. long (2) **P. taipingensis**

g. Base of leaf acute, rarely rounded, not unequal-sided; petiole 5–7 mm. long (3) **P. monticola**

f. Plants of lowland forest, elevation much below 4,000 feet; leaves 14–16 cm. long, nerves 14–24 pairs, texture of leaf thicker; carpels stalked except in *macrophylla* var. *sessilicarpa*

h. Flowers 1–2, each with pedicel, not in cymes

i. Leaves rounded or acute at the base, usually pubescent beneath, sometimes glabrous; carpels stalked (4) **P. macrophylla**

i. Leaves acute at base, glabrous beneath and occasionally pubescent; carpels sessile (4) **P. macrophylla** var. **sessilicarpa**

h. Flowers in cymes; leaf base rounded (4) **P. macrophylla** var. **cymosa**

(1) **P. setosa** (King) J. Sinclair in Gard. Bull. Sing. 14: 1 (1953) 43.

Basonym: Orophea setosa King, Mat. F.M.P. Vol. 1 No. 4 (1892) 329 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 102 Pl. 131B. Ridley, F.M.P. 1 (1922) 70.

Shrub 2–3 m. high. *Young twigs,* petioles, leaf margins, lower midrib and veins of lower surface covered with yellowish-brown, erect, 2–3 mm. long hairs. *Leaves* membranous, oblong to oblong-oblanceolate, apex shortly acuminate, base rounded, emarginate and equal-sided; nerves 12–13 pairs, faint above, prominent beneath, oblique and interarching near edge; midrib pubescent above;

reticulations faint above, distinct below, a few scalariform and the rest forming a loose open network; length 11–16 cm.; breadth 4·5–7 cm.; petiole 1–2 mm. long. *Flowers* unisexual, solitary, axillary on slender, pubescent pedicels 1·8–2 cm. long with a minute sub-medial bract. *Sepals* sub-orbicular, obtuse, pubescent outside, 2 mm. long. *Petals* white with pink bases; outer longer than the sepals, broadly ovate, sub-acute, pubescent outside, glabrous inside; inner 6 mm. long, vaulted, the limb trapezoid-sagittate; the claw narrow, shorter than the limb. *Male flowers* with numerous stamens, connectives convex. *Ovaries* sub-globose, slightly curved inwards, style absent, stigma sub-capitate, grooved adaxially. *Ripe carpels* 1–6, sessile, globose, greyish-yellow, tomentose, 1·8–2 cm. in diam. *Seeds* 1 rarely 2; testa pale, rather rough, albumen dense.

KEDAH: *Mohamed 17571* (S., K.).

KELANTAN: Gua Lambok, S. Betis, *Henderson S.F.N. 29713* (S., K., Kew); Chaning Woods, *Ridley 12th February, 1917* (S., Kew); Bukit Bubong, *Mohamed 3305* (K.).

PERAK: *Scortechini no number* (C., Kew) type material; Gopeng, *King 687* (S., C.) type material; Gunong Pondok, *King 8285* (S., C., D.D., Kew) type material.

PAHANG: Sungei Nering, *Henderson S.F.N. 10711* (S.); Jerantut, *Holttum S.F.N. 24754* (S., K.); Sungei Bibut F.R., Raub, *Osman 28402* (K.); Raub, *Ismail 20306* (K.).

DISTRIBUTION: Siam.

This species has been misplaced by King. It has all the characters of *Pseuduvaria.*

var. **major** J. Sinclair, **var. nov.**

A typo foliis majoribus, carpellis stipitatis differt.

Folia usque ad 22 cm. longa, 7–8 cm. lata. *Carpella* matura 1–8; stipites 5–7 mm. longi quam pedicelli crassiores.

PAHANG: Tembeling, *Henderson S.F.N. 21793* (S.).

(2) **P. taipingensis** J. Sinclair, **sp. nov.**

Haec species *P. setosae* carpellis sessilibus proxima sed foliis nec setosis nec oblanceolatis nec basi aequilateralibus differt.

Arbor parva. *Ramuli novelli* pilis fulvis erectis 1 mm. longis sparse tecti, mox glabri et nigri. *Folia* papyracea, oblonga vel oblongo-lanceolata, apice acuminata, basi rotundata et inaequilateralia, 10–17–(30) cm. longa, 4·5–10 cm. lata; costa subtus infra medium pilis paucis 1 mm. longis praedita excepta, glabra; nervi 12–13 pares, obliqui, supra graciles, subtus prominentes; reticulationes utrinque visibiles, laxae; petioli 3 mm. longi pubescentes. *Flores* 1–2 axillares. *Pedicelli* tenues 1·8 cm. longi, pubescentes cum duabus bracteis minutis, una basali, altera mediana.

Sepala ovata, acuta, extus pubescentia, intus glabra, 1 mm. longa. *Petala* extus pubescentia, intus glabra; exteriora ovata, acuta, straminea, 2·5 mm. longa; interiora mitriformia, acuta, brunneo-purpurea, 6 mm. longa. *Stamina* 1 mm. longa, connectivis apice planis. *Ovaria* 0. *Flores feminei* non visi. *Carpella* matura 1–3, sub-globosa 1·8–2 cm. in diam., sessilia, minute cinereo-tomentosa, interdum rugulosa et in uno latere longitudinaliter saepe carinata. *Semina* plura. **Fig. 30.**

PERAK: Above Taiping, *Anderson 128* (S.); Maxwell's Hill, *Wray 806* (S., C.); *Curtis 1991* (S.) holotype; *Ridley, date 1892* (S.); North side of Birch's Hill (Maxwell's Hill), *Burkill* and *Haniff S.F.N. 13028* (S., K.).

DISTRIBUTION: No other records.

Fig. 30. *Pseuduvaria taipingensis* J. Sinclair.
Twig with leaves and fruit.

Burkill and Haniff give the elevation as 4,200 feet. The above sheets have in the Singapore herbarium either been named *P. reticulata* or species aff. *rugosa*. Both *P. reticulata* and *P. rugosa* have stalked carpels and the flowers several in fascicles not generally single or in pairs as in *P. taipingensis*. Further the leaves are not notched at the base as in *P. taipingensis* and the petioles are longer with a tuft of erect hairs 1 mm. long.

(3) **P. monticola** J. Sinclair, **sp. nov.**

P. reticulatam foliis dense reticulatis nonnihil revocat sed floribus non fasciculatis, carpellis fere sessilibus differt. A *P. setosa* et *P. taipingense* quae carpella sessilia habent, foliis glabris basi acutis raro rotundatis nunquam emarginatis recedit.

Arbor parva 3–5 m. alta. *Ramuli novelli* deciduo-pubescentes. *Folia* papyracea, oblongo-lanceolata nitida, apice acuta basi cuneata raro rotundata, supra secus costam puberula, subtus glabra, 12·5–19 cm. longa, 4–6 cm. lata; nervi 12–13 pares, supra distincti, subtus prominentes, obliqui, recti, paralleli, prope marginem anastomosantes; reticulationes densae, subtus distinctae; petioli 5–7 mm. longi. *Flores* 1, raro 2, axillares, in alabastro sub-globosi. *Pedicelli* 8 mm.–1 cm. longi pubescentes, bracteis 2–3 basilaribus et una sub-mediana praediti. *Sepala* ovato-orbiculata sub-acuta puberula, 2 mm. longa. *Petala* alba vel rosea, marginibus pubescentia, intus glabra; exteriora orbiculata obtusa, 3 mm. longa; interiora coriacea, mitriformia, 6 mm. longa ungue brevi 2–3 mm. longo, lamina 3 mm. longa. *Flores masculi*:—stamina numerosa 1 mm. longa, connectivis apice planis. *Flores feminei*:—staminodia pauca; ovaria circiter 10, oblonga, tomentosa; stigmatibus sessilibus. *Carpella* matura globosa, minute tomentosa, 2 cm. diam., fere sessilia cum stipitibus 2–3 mm. longis. *Semina* plura. **Fig. 31.**

PAHANG: Cameron Highlands, *Holttum S.F.N. 31399* (S.) holotype; *Symington 20831* (S., K.).

SELANGOR: Ginting Bidai, *Ridley, May 1896* (S.).

DISTRIBUTION: Siam, Bachaw, Pattani, *Kerr 7184*.

A mountain species with almost sessile carpels and closely reticulate leaves. In the Cameron Highlands it grows at 5,000 feet.

(4) **P. macrophylla** (Oliv.) Merr. in Philipp. Journ. of Sc. Bot. Vol. 10 No. 4 (1915) 225.

Basonym: Mitrephora macrophylla Oliv. in Hook. Icon. 16 (1887) T. 1562; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 336 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 114 Pl. 157; Ridley, F.M.P. 1 (1922) 74; Craib, Fl. Siam. Enum. 1 (1925) 52.

Small tree. *Young twigs* densely yellow-brown tomentose, becoming glabrous. *Leaves* thinly coriaceous, varying a good deal in size and shape, oblong-lanceolate or oblong-obovate, apex acute or shortly acuminate, base rounded, both surfaces slightly pubescent, especially the lower, later sometimes glabrous; nerves 14–20 pairs, oblique, prominent, interarching close to margin, reticulations distinct, lax, some of them scalariform; length 14–32 cm.; breadth 5–12 cm.; petiole 5 mm.–1 cm. long, swollen, tomentose. Flowers solitary or less often in pairs, axillary. *Pedicels* about 2 cm. long, pubescent with a minute median bract. *Sepals* broadly ovate, sub-acute, puberulous outside and on the edges, glabrous inside, 2 mm. long. *Petals* red, outer like the sepals but 3 mm. long; inner 7 mm. long, thick, mitriform, sagittate, puberulous outside and pubescent along the united edges, glabrous at base inside, claw narrow. *Male flowers:* stamens numerous, short, cuneate with flat-topped connectives. *Ovaries* 3 or more, rudimentary. *Female flowers:* staminodes present. *Ovaries* about 12, ovoid-cylindrical, slightly curved, pubescent, stigma sessile, sub-capitate.

Fig. 31. *Pseuduvaria monticola* J. Sinclair.
A, Flowering twig. B, Fruiting twig.

Ripe carpels globose, densely and minutely tawny-tomentose. 1·6 cm. in diam.; stalks 1 cm. long. *Seeds* 2, compressed, wrinkled, obliquely longitudinally grooved.

DISTRIBUTION: Siam. Herbarium material from all the Malayan states except Perlis, Province Wellesley, Johore and Singapore. Type material from Penang (*Maingay* and *Curtis*). Also found in Sumatra.

var. **cymosa** J. Sinclair, **var. nov.**

A typo inflorescentia cymosa, foliis minus pubescentibus vel glabris differt.

Cymae breves circiter 2 cm. longae. *Bractae* pedunculares plures, bifariae, alternatae imbricatae. *Pedicelli* bractea minuta mediana praediti. **Fig. 32.**

PERAK: Larut, *Scortechini 1514* (S., C.); Temango, *Ridley 14601* (S.); Tea Gardens, *Ridley 2985* (S., C.); Upper Perak, *Wray 3502* (S.); Maxwell's Hill, *Ridley 5377* (S.); *Wray 2942* (S., C.); Lenggong, *Ridley 14600* (S.); Waterloo, *Curtis 1279* (S., Kew).

SELANGOR: Batu Caves Estate, *Ridley 8248* (S., Kew) holotype.

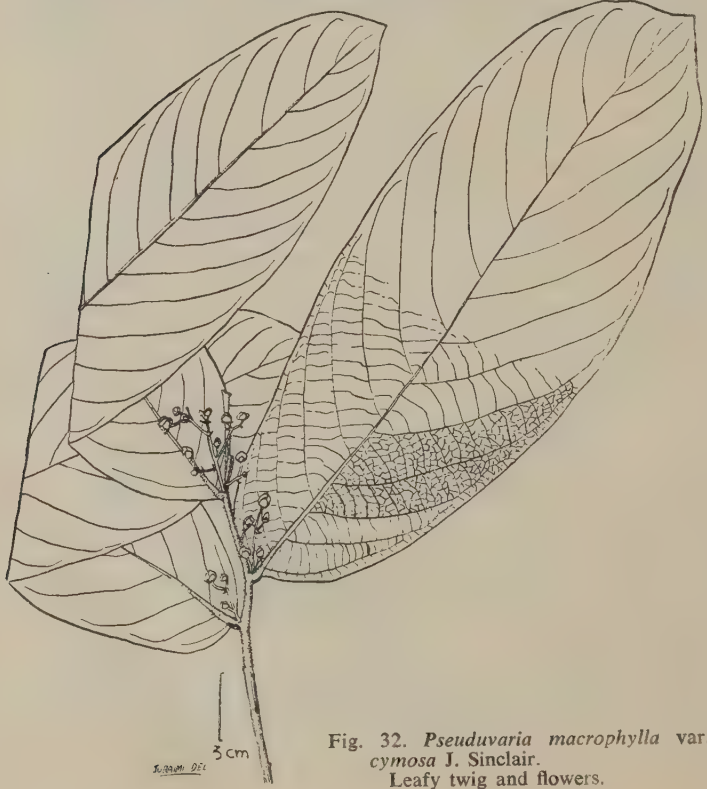


Fig. 32. *Pseuduvaria macrophylla* var. *cymosa* J. Sinclair.
Leafy twig and flowers.

I have given this form with the cymose inflorescence a name. King includes it in *P. macrophylla* but he states 'In the specimen figured by Professor Oliver (Hook. Ic. Pl. 1562), the flowers are in axillary pairs; but in the majority of the Perak specimens they are in cymes.' [Ann. Roy. Bot. Gard. Calc. 4 (1893) 144].

Fig. 33. *Pseuduvaria macrophylla* var. *sessilicarpa* J. Sinclair. A, Twig with flower and fruit. B, Flower. C, Stamen.

var. **sessilicarpa** J. Sinclair, **var. nov.**

A typo carpellis sessilibus obovatis, foliis basi acutis majusculis differt.

Folia 16–46 cm. longa, 6–14 cm. lata, glabra, costa supra interdum puberula; nervi 18–24 pares. *Flores* 1–2, axillares vel ex axilla foliae delapsae orti. **Fig. 33.**

JOHORE: Sungei Kayu, *Kiah, 3rd October, 1936* (S.) holotype; S. Kayu, Mawai-Jemaluang Road, *Corner, 11th October, 1436* (S.); 13½ mile Mawai-Jemaluang Road, *Corner S.F.N. 29438* (S., Kew); S. Buloh Kasep, *Corner, 5th November, 1936* (S.); 5½ mile Kota Tinggi-Mawai Road, *Corner S.F.N. 21316* (S., K., Kew); North of Gunong Belumut, *Holttum S.F.N. 10611* (S., K.); Gunong Panti, *Ridley 4189* (S., C.); Kuala Kahang, *Lake & Kelsall, 29th October, 1892* (S.).

The upper surface is a dull medium green and the lower slightly paler. The young twigs and petioles are velvety, greyish-pubescent but becoming black and striate lower down. The sepals and petals are purple, the knobs on the inside of the latter are brownish. The stamens are pinkish white.

Moysey and *Kiah S.F.N. 33766,* collected at Ulu Brang in Trengganu is probably also this variety and has large leaves, acute or sub-acute at the base with numerous parallel nerves.

(5) **P. rugosa** (Bl.) Merr. in Philipp. Journ. Sc. 10 Bot. (1915) 255.

Basonym: Uvaria rugosa Bl. Bijdr. (1825) 12 et Fl. Jav. Anon. (1830) 47 T. 22.

Synonyms: Orophea rugosa Miq. Fl. Ind. Bat. 1 Part 1 (1858) 26. *Mitrephora rugosa* Boerl. in Icon. Bogor. 1 (1899) 140. *Mitrephora trimera* Craib in Kew Bull. (1913) 65 et Fl. Siam. Enum. 1 (1925) 53.

Tree 5–7 m. high. *Young twigs* very slender, minutely puberulous, soon glabrous, striate and dark coloured. *Leaves* membranous or papery, lanceolate or oblong-lanceolate, apex acute or acuminate, base acute and narrowed, rarely rounded, both surfaces glabrous; nerves about 14 pairs, slender above and below, prominent below, oblique and straight, leaving the midrib at an acute angle (20°–30°) and running up some distance before reaching the margin, usually not but occasionally anastomosing, reticulations very fine on both surfaces; length 12–20 cm.; breadth 4·5–6·5 cm.; petiole 7 mm.–1 cm. long. *Flowers* several in axillary fascicles. *Pedicels* slender, adpressed-pubescent, 1–1·5 cm. long with minute, obtuse bracts, 2 basal and one sub-median. *Sepals* broadly ovate, sub-acute, pubescent outside, glabrous inside, 1

mm. long. *Outer petals* ovate-orbicular, pubescent outside, glabrous inside, reflexed, 1·5 mm. long. *Inner petals* pubescent on both surfaces, total length about 7 mm., blade 4-sided, 2–3 mm. long without glands on the inside, claw very slender, 4 mm. long. *Stamens* numerous, 0·5 mm. long. *Ovaries* not present in male flowers. *Female flowers*:—1 whorl of about 6 staminodes of which one or two are fertile but more reduced than the normal stamens (i.e. having 1–2 pollen sacs). *Ovaries* 1·5 mm. long, oblong,

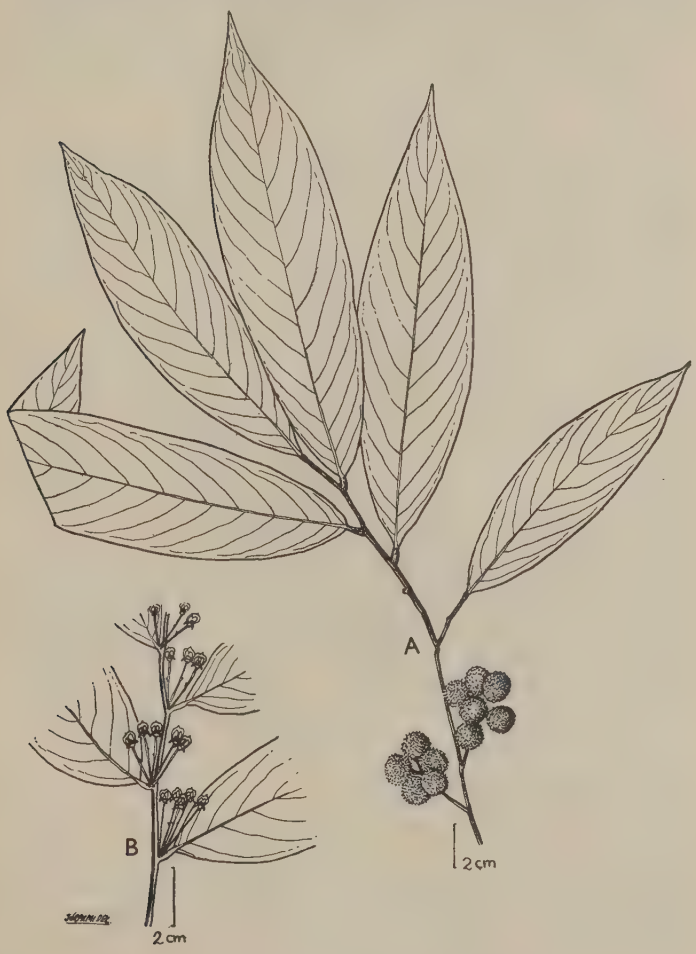


Fig. 34. *Pseuduvaria rugosa* (Bl.) Merr.
A, Fruiting twig. B, Flowering twig.

slightly curved inwards, tomentose; stigmas sessile with U-shaped opening on top and split adaxially. *Ripe carpels* globose, minutely pale yellowish-brown-tomentose, verrucose with a longitudinal ridge on one side, 1·5 cm. in diam.; stalks 8 mm. long, tomentose. *Seeds* 1–4. **Fig. 34.**

KELANTAN: Kota Bahru, *Ridley, February 1917* (S.).

PENANG: Pulau Boetong Reserve, *Curtis, March 1892* (S.).

PERAK: Kuala Depang, *King 8238* (S., C.) ?; *King 10977* without exact locality (S., D.D., Kew); Waterloo, *Curtis, May 1890* (S.); Kati, Kuala Kangsar, *Haniff S.F.N. 14959* (S.).

PAHANG: Titi Bungor, Temerloh, *Henderson F.M.S. Mus. Herb. 10554* probably (S.); Sungei Nering, Temerloh, *Henderson F.M.S. Mus. Herb. 10595* (S.).

MALACCA: Bukit Sidenan, *Pengulu Bebas Nos. 120; 132* and *135* (S.).

DISTRIBUTION: Burma, Siam, Sumatra, Java and Borneo.

Most of the above material has been named *P. reticulata* in the Singapore Herbarium but true *P. reticulata* is not found as yet in Malaya. *P. rugosa* was not previously recorded. *P. rugosa, P. reticulata* and *P. Diepenhorstii* resemble each other by having their flowers in axillary fascicles and not singly or in pairs. The flowers and pedicels of *P. reticulata* are densely tomentose and not pubescent as in *P. rugosa*. The pedicels are much stouter too than those of *P. rugosa*. In *P. Diepenhorstii* the flowers also resemble those of *P. reticulata* in that they are tomentose but the petals and sepals are smaller than those of *P. reticulata,* being about the same size as those of *P. rugosa*. The very verrucose carpels of *P. rugosa* with the almost spiny warts will at once separate it from the smooth ones of *P. reticulata* while the Sumatran *P. Diepenhorstii* has slightly verrucose carpels but the projections are rounded.

P. reticulata has thicker twigs than *P. rugosa*. Its leaves too are thicker in texture, often slightly falcate, the base usually rounded and not narrowed so much, the nerves and midrib are thicker and never as straight. The reticulations stand out in bold relief on the lower side and are not so fine as those of *P. rugosa*. It has been found in Java, Borneo and Bali.

The leaves of *P. Diepenhorstii* recall those of *P. rugosa* but the reticulations are bolder, being more like those of *P. reticulata*.

(6) **P. galeata** J. Sinclair, **sp. nov.**

Ab alteris speciebus malayanis floribus fere triplo-maioribus differt.

Arbor 6–8 m. alta. *Ramuli novelli* petiolique primum pilis fulvis erectis dense tecti, deinde glabri et nigri. *Folia* papyracea, oblongo-lanceolata vel oblanceolata, in costa utrinque pubescentia.

9–17 cm. longa; 3–6·5 cm. lata; apice acuta vel breviter acuminata; basi rotundata; nervi 12–16 pares, obliqui, prominentes subtus pubescentes, prope marginem anastomosantes; reticulationes utrinque visibiles densae; petioli 4–5 mm. longi. *Flores* 1–2 axillares. *Pedicelli* 1·3–1·8 cm. longi penduli, dense pubescentes, bracteis duabus, una apud basin altera in apice praediti. *Sepala* late ovato-triangularia, sub-acuta, 4–5 mm. longa, basi conjuncta, extus pubescentia, intus glabra. *Petala* rosea vel purpurea 8 mm. longa, extus pubescentia, intus glabra, sub-rotunda, apice obtusa, versus basin aliquantum angustata; interiora 1·8 cm. longa mitriformia, duobus glandibus flavis intus praedita. *Stamina* in floribus mas-

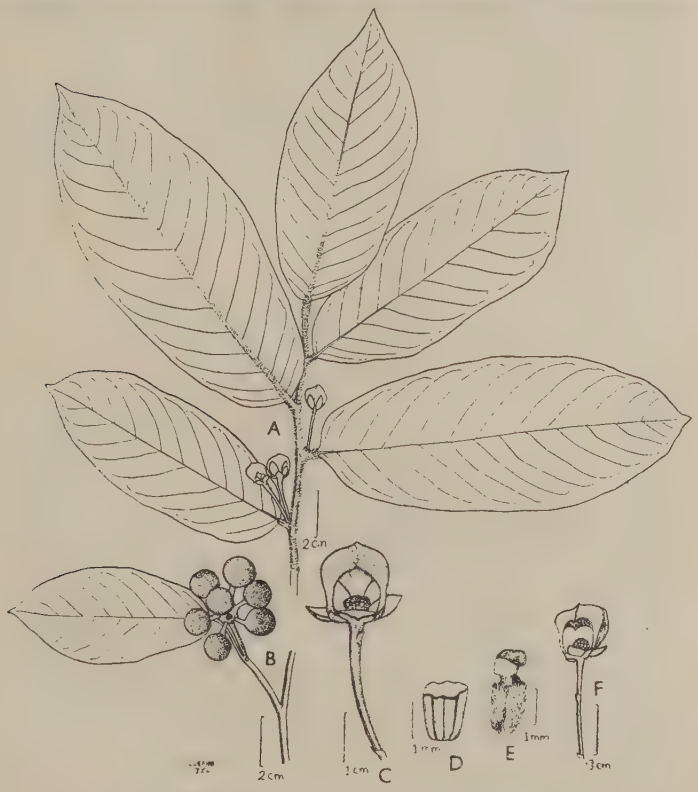


Fig. 35. *Pseuduvaria galeata* J. Sinclair.
A, Flowering twig. B, Fruit. C, Flower. D, Stamen. E, Gynoecium. F, Flower of *P. macrophylla* var. *sessilicarpa* for comparison.

culis numerosa, 1 mm. longa, connectivis apice planis; staminodia in floribus femineis pauca (interdum partim fertilia). *Ovaria* 2 mm. longa, oblonga, angulata, pubescentia, incurvata; stigma sessile, sub-capitatum, latere adaxiali sulcatum. *Carpella matura* globosa, dense et breviter tomentosa, 1·3–1·5 cm. in diam.; stipites 7 mm. longi tomentosi. *Semina* c. 5, rugulosa. **Fig. 35.**

JOHORE: 14th mile Mawai-Jemaluang Road, *Corner S.F.N. 29022* (S., K., C., Kew) holotype; S. Berassau, Mawai-Jemaluang Road, *Corner S.F.N. 29933* (S., K., Kew); S. Kayu Ara, Mawai-Jemaluang Road, *Corner S.F.N. 29194* (S., Kew) and *S.F.N. 29337* (S., Kew).

Ridley 73552 from Telom, Pahang is probably this species. According to Corner (field label notes on holotype) the flowers are pendulous and a drop of honey collects in the inverted dome of the inner petals.

This species is distinct from the rest of the Malayan ones in the large size of its flowers. *P. grandiflora* from the Philippines has slightly larger flowers. Its leaves are also larger with acute not rounded bases. The midrib is less pubescent and the pedicels are longer and more slender.

(7) **P. nervosa** J. Sinclair, **sp. nov.**

Haec species *P. calliuram* Airy-Shaw foliis longe-caudatis revocat sed foliis basi cordatis, nervis pluribus differt.

Arbor. Ramuli novelli dense hirsuti. *Folia* 23–30 cm. longa, 6–10 cm. lata, papyracea, oblongo-lanceolata, marginibus fere parallelis, apice caudato-acuminata, basi cordata, nervis costaque supra pubescentibus subtus hirsutis; nervi 20–21 pares, obliqui, paralleli, marginibus anastomosantes supra visibiles, subtus prominentes; reticulationes scalariformes; petioli 5 mm. longi, tumidi, hirsuti. *Flores* feminei solitarii, axillares; masculi non visi. *Pedicelli* hirsuti, graciles, 2 cm. longi cum duabus bracteis minutis, una basali, altera mediana. *Sepala* triangularia, acuta, extus hirsuta, intus glabra 3 mm. longa. *Petala* albo-rosea; exteriora ovata, acuta, extus hirsuta, intus glabra, 4 mm. longa; interiora 8 mm. longa, pubescentia mitriformia, unguibus angustis, 3 mm. longis. *Stamina* pauca in uno circulo disposita, 0·5 mm. longa, late cuneata, connectivis apice planis. *Ovaria* 2 mm. longa, pubescentia, aliquantum incurvata 4-angulata; stigma sessile, oblique-capitatum, apice et latere adaxiali sulcata. **Fig. 36.**

TRENGGANU: Ulu Brang-Tersat, *Moysey* and *Kiah S.F.N. 33613* (S.) holotype. Tree growing on hillside near stream. Elevation 2,500 feet.

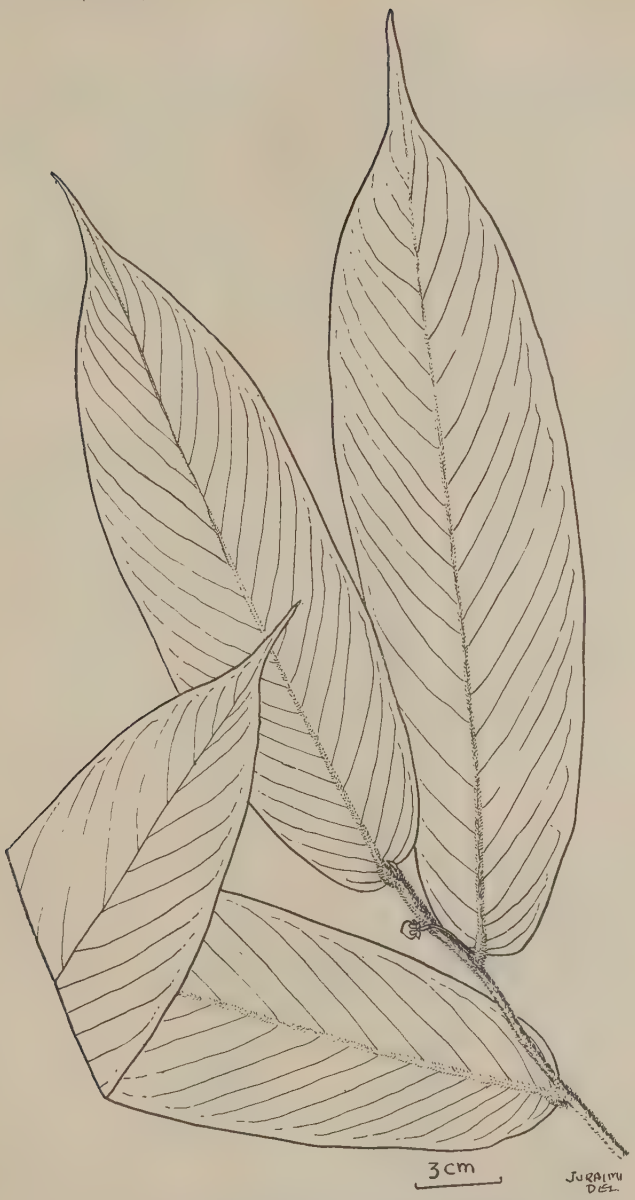


Fig. 36. *Pseuduvaria nervosa* J. Sinclair.
Flowering twig.

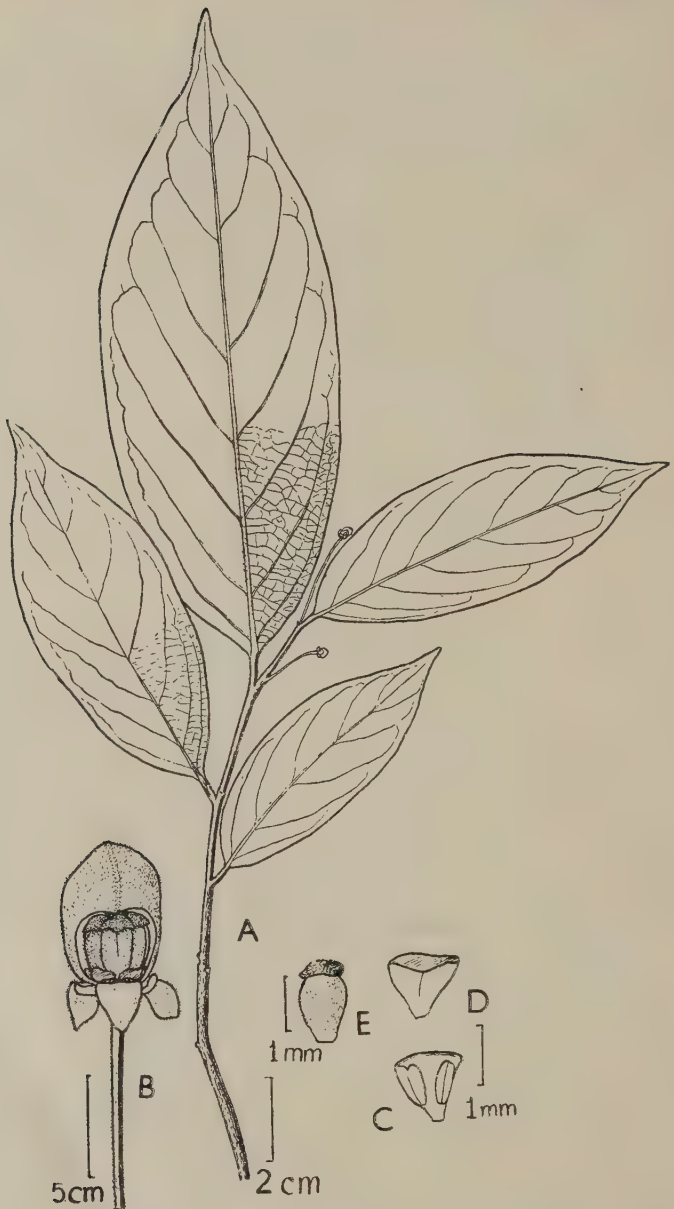


Fig. 37. *Pseuduvaria cerina* J. Sinclair.
A, Flowering twig. B, Flower. C, Stamen, front view. D, Stamen, back view. E, Gynoecium.

(8) **P. cerina** J. Sinclair, **sp. nov.**

Inter species malayanas foliis ramulis omnino glabris distinguitur. Facie foliorum praecipue cum nervis valde obliquis et reticulationibus densis *P. monticolam* haec species revocat sed nervis paucioribus et floribus minoribus recedit.

Frutex monoicus, 5 m. altus. *Ramuli* glabri, pallido-straminei, striati. *Folia* tenuiter coriacea, omnino glabra, supra atro-viridia nitida, subtus fere concoloria minute punctata, lanceolata vel elliptico-lanceolata, apice acuminata, basi acuta in petiolo leviter decurrentia; 8–15 cm. longa; 3–5.5 cm. lata; petioli 6 mm.–1 cm.

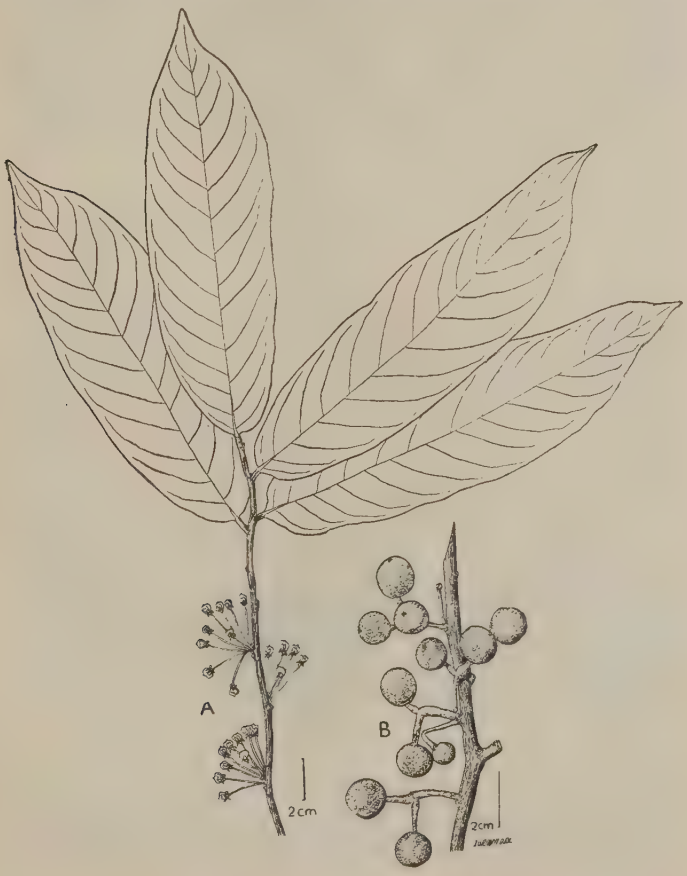


Fig. 38. *Pseuduvaria reticulata* (Bl.) Miq.
A. Flowering twig. B. Fruit.

longi, glabri; nervi 6–8 pares supra graciles impressi, subtus elevati, oblique angulo 30°–40° adscendentes, prope marginem arcuati; reticulationes tenues densissimae. *Pedicelli* graciles 1–2·5 cm. longi, axillares, solitarii, medio vel supra bractea 1 cm. longa acuta pubescenti praediti. *Flores masculi: sepala* late triangularia, obtusa, viridia, extus pubescentia, intus glabra, 1 mm. longa; *petala exteriora* viridia, ovato-rotunda, obscure 1-nervosa, obtusiuscula, circiter 2 mm. longa a similimodo utrinque pubescentia; *petala interiora* 4–5 mm. longa, cerea lutea, indumento consimili, in laminas 2 mm. longas et ungues filiformes 2 mm. longos divisa; *stamina* numerosa 0·5–0·7 mm. longa, connectivis truncatis. *Flores feminei: tepala* masculis similia; *ovaria* tomentosa, oblonga, leviter angulata, 1·5 mm. longa; *stigmata* sub-capitata sessilia; *staminodia* pauca circum ovariorum basin, annulata. *Fructus* non visus. **Fig. 37.**

TRENGGANU: Bukit Bauk F.R., 5½ mile Dungun-Paka Road, *Sinclair S.F.N. 39907* (S.) holotype.

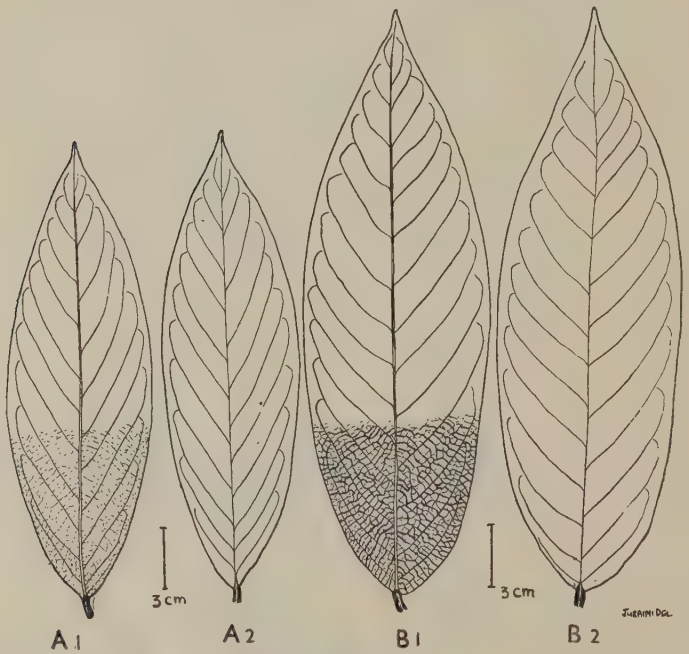


Fig. 39. A^1, Lower surface, A^2, upper surface of leaf of *Pseuduvaria rugosa*. B^1, lower surface, B^2, upper surface of leaf of *Pseuduvaria reticulata*.

The entirely glabrous twigs and leaves with 6–8 very oblique nerves and the yellow, waxy, inner petals should distinguish this from the other Malayan species.

33. NEO-UVARIA Airy-Shaw in Kew Bull. (1939) 278.

Trees. *Young twigs* and leaves with stellate hairs. *Flowers* axillary, 1–3 in fascicles. *Sepals* valvate, *Petals* valvate, coriaceous, sub-equal, spreading, (the inner adhering by the edges at first ?); outer keeled on the inside, the inner with a circular, concave or triangular patch at the base inside, the apices very thick and slightly incurved, the bases narrowed into a rudimentary claw so that three arched spaces show as in the *Mitrephoreae*. *Stamens* 20–30, very short with broad, convex, truncate connectives. *Ovaries* 4–12, oblong-ovoid, pubescent, the stigma clavate, glabrous, bent outwards slightly, ovules 1–2. *Ripe carpels* 1–6, sessile or nearly so, tomentose, the walls rather hard. *Seed* 1, filling the carpel.

TYPE OF THE GENUS: *N. foetida* (Maing. ex Hook. f. et Th.) Airy-Shaw in Kew Bull. (1939) 278.

DISTRIBUTION: Malaya, Borneo, Sumatra and the Philippines. Two species.

The nearest affinity is probably with *Popowia* and not *Uvaria*. In fact I can see little resemblance to *Uvaria* (climbers) except that both have stellate hairs. The leaves recall in texture those of *Popowia*. The inner petals too are similar with their concave bases, and thickened, slightly incurved apices. They differ since they spread but is probable that they are erect to begin with and adhere by their margins and apices. They are narrowed at the base and three spaces can be seen with stamens showing when the outer are removed. This is similar to what is found in *Goniothalamus, Oxymitra* and the other *Mitrephoreae* and is not observed in *Uvaria*. The fruit of *P. fusca* and *P. tomentosa,* wrinkled when dry and although very much smaller, resembles that of *N. acuminatissima. The number of the ovules* 1–2 is also in keeping with that of *Popowia*. Most species of *Uvaria* have several ovules in two rows. *Neo-uvaria* differs from *Popowia* in having axillary flowers.

KEY

a. Leaves densely and uniformly tomentose below; soft to touch beneath, flower-buds sub-globose; ovules generally 2; fruiting carpels very large, 6–8 cm. long by 3·5–4 cm. in diam.
(1) **N. foetida**

a. Leaves never so densely tomentose, often merely pubescent or almost glabrous between the nerves; harsh to the touch beneath; flower-buds oblong; ovule 1, fruiting carpels much smaller, 1·5–3·7 cm. long by 7 mm.–2·6 cm. in diam.
(2) **N. acuminatissima**

(1) **N. foetida** (Maing. ex Hk. f. et Th.) Airy-Shaw in Kew Bull. (1939) 278.

Basonym: Popowia foetida Maing. ex Hk. f. et Th. Fl. Br. Ind. 1 (1872) 69; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 342 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 119 Pl. 161A; Ridley, F.M.P. 1 (1922) 76.

Large tree. *Young twigs* tawny-tomentose, angled, the older glabrous and with numerous permanent leaf scars. *Leaves* thinly coriaceous, elliptic-lanceolate, shortly caudate-acuminate, the base acute, upper surface glabrous except the midrib, lower densely covered with yellow-grey tomentum; nerves 11–18 pairs, curving and ascending, interarching near the margin, prominent beneath; reticulations scalariform, visible above, prominent beneath; length 15–22 cm., breadth 4–10 cm.; petioles tomentose, swollen, 5–7 mm. long. *Flowers* solitary, axillary; pedicels 5 mm. long, tomentose. *Sepals* ovate, obtuse, 2 mm. long. *Petals* coriaceous, the outer ovate-elliptic, obtuse, yellow, the inner concave, apiculate with thick margins. *Stamens* about 30, the connectives large. *Ovaries* about 6, strigose, 2-ovuled; style rather slender. *Torus* stout, hemispheric. *Ripe carpels* 1–6, large, 6–8 cm. long and 3·5–4 cm. in diam., oblong-ovoid, obtuse, sessile, densely and shortly yellowish-tomentose. *Seed* solitary oblong with bony testa.

Negri Sembilan: Kuala Pilah, *Yassim 4500* (S., K.).

Malacca: *Maingay 55* (Kew); *1055* (Kew); *1349* (Kew); *1349A* (Kew) Maingay's numbers type material; Sungei Udang, *Holmburgh 756* (S., C.); *Derry 6* (S.).

Distribution: Sarawak and N. Borneo.

I have seen fruits of this species but no flowers. King cites *Curtis 2768,* Penang for this species but this number is really *N. acuminatissima.* This species is distinguished from *N. acuminatissima* by having larger fruits and the leaves beneath are soft to the touch, not scabrid.

(2) **N. acuminatissima** (Miq.) Airy-Shaw in Kew Bull. (1939) 279.

Basonym: Uvaria acuminatissima Miq. in Ann. Mus. Bot. Ludg.-Bat. 2 (1865) 6; Ridley in Sarawak Mus. Journ. 1/3 (1913) 74.

Synonyms: Mitrephora ferruginea Merr. in Gov. Lab. Publ. (Philipp.) 17 (1904) 16 excl. descr. fl. et in Phil. Journ. Sc. 1 Suppl. (1906) 54 non Boerl. *Mitrephora Merrillii* C. B. Rob. in Bull. Torr. Bot. Club. 35 (1908) 67. *Mitrephora viridifolia* Elm. Leafl. Phil. Bot. 5 (1913) 1716. *Griffithianthus Merrillii* (C.B. Rob.) W. H. Brown ex Merr. in Phil. Journ. Sc. 10 (1915) 231; Merr. in Univ. Calif. Publ. Bot. 15 (1929) 74.

Tree 10–15 m. high. *Twigs* as in *N. foetida. Leaves* as in *N. foetida* but scabrid to the touch beneath, often caudate-acuminate. *Flowers* axillary or from the axils of fallen leaves in fascicles of 2–3 but only one flower developing at a time. *Pedicels* 5 mm. long, densely rusty-pubescent with 3 small ovate pubescent bracts above the middle. *Sepals* broadly ovate-triangular obtuse to sub-acute, pubescent on both surfaces, 3 mm. long and 3·5 mm. wide. *Petals* creamy white, obtuse, the outer narrow-oblong, slightly keeled inside, very shortly and densely tomentulose, about 1–1·5 cm. long and 4 mm. wide; the inner sub-equal or slightly smaller, arched in the bud, tomentulose, the apices and margins very thick with a basal excavated, circular or triangular patch inside. *Stamens* about 25, rather crowded, 1·8 mm. long and 1 mm. wide, the connectives broad, thin, flat-topped, the filaments as long as the anthers. *Ovaries* 8–12, ovoid-linear, pubescent, 2 mm. long, style very short, stigma thickened, cylindric, slightly falcate, split on the inner side; ovule one. *Ripe carpels* 4–6 densely and shortly stellate-tomentose, oblong, obtuse, sessile, 3–4 cm. long and 1·7–2·5 cm. in diam.; wall 2 mm. thick. *Seed* filling the carpel, longitudinally grooved all round.

PENANG: Pulau Boetong, *Curtis 2768* (S., C., Kew).

PAHANG: Rotan Jungle Reserve, Raub, *Osman 28526* (K.).

DISTRIBUTION: Borneo, Sumatra, Philippines. *Type* Dusun River, Borneo (Korthals), Herb. Kew.

34. GONIOTHALAMUS Hk. f. et Th Fl. Ind. 1 (1855) 105. *Polyalthia* section *Goniothalamus* Bl. Fl. Jav. Anon. (1830) 71 and 79.

Shrubs or small trees. *Leaves* coriaceous or membranous; nerves prominent, oblique, straight and parallel with scalariform reticulations or very fine, sometimes scarcely distinct, not straight or parallel but with a lax network of reticulations, not scalariform. *Flowers* usually axillary, sometimes terminal and axillary or cauliflorous. *Pedicels* with several minute, lanceolate, distichous bracts at the base. *Sepals* valvate, large or small, usually membranous,

several-veined and reticulate, free or forming a cup, often persistent in fruit. *Petals* valvate, coriaceous; outer flat or nearly so, one-veined, slightly clawed or truncate at base; inner smaller, half as long or less, clawed, cohering above to form a vaulted cap over the stamens. *Stamens* many, linear-oblong, pollen grains large, visible under a hand lens, connectives apiculate or convex. *Ovaries* numerous, cylindrical, pubescent or glabrous; style linear, grooved on the anterior side; stigma funnel-shaped or narrowly so, split down the inner side, often two-lobed, rarely cylindrical and truncate. *Carpels* stalked or sessile; 1–2 seeded (4 in *G. uvarioides*).

TYPE OF GENUS: *G. macrophyllus* (Bl.) Hk. f. et Th. Fl. Ind. 1 (1855) 109 *in nota.*

DISTRIBUTION: S. and E. India, Ceylon, Burma, Siam, Indo-China, Malaya to N. Guinea and the Philippines. About 114 species.

A large genus well represented in Malaya. I have sorted the species into two groups:—those with apiculate stamen connectives and those with convex. This is useful but may be somewhat artificial as the following will show:—

Several species with apiculate connectives have numerous, prominent, parallel and straight veins with scalariform reticulations. Belonging to this group are *G. calycinus, Curtisii, Ridleyi, Scortechinii, uvarioides* and *Wrayi.* Now *G. fulvus* has the same type of leaves and venation but cannot be placed here on account of the convex connectives.

Several species have very coriaceous leaves with fine, slender, rather wavy, non-parallel veins. There are usually 1–3 secondary veins between the main veins and these are quite as prominent as the main ones. The reticulations are open and lax but not scalariform. One might expect the species with this type of leaf all to have the same kind of connectives but this is not so. *G. giganteus* and *malayanus* have convex ones while in *G. tapis* and *tortilipetalus* they are apiculate.

The Malayan species are distinct and not difficult to identify except for a small group with thin leaves. Included here are *G. tenuifolius, rotundisepalus* and *undulatus. G. tenuifolius* is especially troublesome as it varies considerably. I have ventured to lump *G. Kunstleri* and *caudifolius* under it as I can not see any constant character by which to distinguish these three.

Goniothalamus seems to be nearest *Oxymitra* especially in the structure of the flower. *Oxymitra* differs however in having extra-axillary flowers and the inner petals are not clawed. Further all the species of *Oxymitra* are climbers.

KEY

a. Stamen connectives flat-topped or convex

b. Stigma cylindrical and truncate, not funnel-shaped; nerves of leaf very faint (1) **G. subevenius**

b. Stigma funnel-shaped, often lobed; veins distinct or not

c. Outer petals linear-lanceolate, tapering to a long slender apex, 2–3 mm. broad at middle; nerves very prominent below, oblique and nearly parallel (2) **G. fulvus**

c. Outer petals much broader than 2–3 mm. and not tapering to a long slender apex; nerves indistinct, faint or slightly prominent, but usually less straight and not parallel

d. Leaves coriaceous or thinly coriaceous; secondary veins often numerous and nearly as prominent as the primary

e. Nerves very faint or scarcely visible; leaves elliptic-lanceolate; flowers often terminal; carpels 1-seeded; a mountain species (3) **G. Holttumii**

e. Nerves fine but distinct; leaves oblong to elliptic-oblong; flowers axillary; carpels more than 1-seeded

f. Carpels sessile; young twigs rusty-tomentose, under surface of leaves pubescent becoming glabrous (4) **G. Macranii**

f. Carpels stalked; young twigs glabrous, undersurface of leaves glabrous

g. Outer petals 8–15 cm. long and 4·5–9 cm. broad; pedicels 2·5–4·5 cm. long, stout, 3 mm. thick in dried specimens; ripe carpels oblong, elongated, warted, 3–4·5 cm. long; stalk 1 cm. long, 1–2 seeded (5) **G. giganteus**

g. Outer petals 3–8 cm. long and 1·5–2·5 cm. broad; pedicels 1–1·8 cm. long, slender, 1·5–2 mm. thick when dry; ripe carpels oblong, elongated, smooth 2·5–3·5 cm. long; stalks 5 mm. long, 2–5 seeded (6) **G. malayanus**

d. Leaves membranous; secondary nerves few and less prominent than the primary

h. Petals 1 mm. thick, coriaceous, leaf margin undulate; carpel stalks 1 cm. long (7) **G. undulatus**

h. Petals less than 1 mm. thick, thinly coriaceous; leaf margin slightly or not undulate; carpel stalks 4–5 mm. long

i. Sepals broadly ovate, acute or acuminate; leaves lanceolate or oblong-lanceolate; pedicels 5 mm.–2 cm. long (8) **G. tenuifolius**

i. Sepals rotund; leaves oblong or elliptic-oblong to ovate-oblong, texture granular like parchment; pedicels 4–5 mm. long (9) **G. rotundisepalus**

d. Leaves membranous or sub-coriaceous, secondary and primary nerves very faint on both surfaces (1) **G. subevenius**

a. Stamen connectives apiculate

j. Flowers cauliflorous

k. Leaves coriaceous, drying brown below, veins slender; pedicels 3 cm. long; outer petals 8·8 cm. long, slightly twisted; ripe carpels globular (10) **G. tortilipetalus**

k. Leaves firmly membranous, drying greenish below, veins prominent, oblique and parallel; pedicels 9–13 cm. long; outer petals 4–4·5 cm. long, not twisted; ripe carpels obovoid in dense clusters (11) **G. Ridleyi**

j. Flowers not cauliflorous but often on the older branches

l. Leaves firmly membranous with numerous parallel, oblique, prominent main nerves (16–36 pairs); reticulations scalariform

m. Carpels usually 1-seeded, walls thin 0·25–·5 mm. thick

n. Sepals small, 5–7 mm. long and 3–4 mm. broad; petals not more than 5 mm. broad; leaves 3·5–6 cm. broad (12) **G. Wrayi**

n. Sepals larger, membranous, forming a cup, 1·5–2·6 cm. long and 1·5–2·4 cm. broad; petals 1–1·8 cm. broad; leaves over 6 cm. broad

o. Leaves with dark brown pubescence on petioles and veins beneath; base rounded (13) **G. Curtisii**

o. Leaves glabrous beneath, base acute to sub-acute

p. Pedicels 2–3 cm. long, slender, pendulous; leaves oblong to obovate-oblong with line of interarching of nerves very bold and continuous (14) **G. calycinus**

p. Pedicels 1·5 cm. long, stout, decurved; leaves oblanceolate or oblong-lanceolate; line of interarching of nerves not very bold (15) **G. Scortechinii**

m. Carpels 4-seeded with walls 2 mm. thick (16) **G. uvarioides**

l. Leaves coriaceous or thinly coriaceous, nerves faint and fewer not more than 16 pairs, not parallel and straight but wavy and often curving; reticulations not scalariform

q. Pedicels 3·5–5·3 cm. long, slender, often terminal (17) **G. montanus**

q. Pedicels 5 mm.–1·4 cm. long, stouter, axillary

r. Nerves 14–16 pairs, faint, oblique with 1–3 secondary ones between the main ones

s. Carpels sessile, leaves coriaceous, oblong with rounded, less often acute base (18) **G. tapis**

s. Carpels with stalks 8 mm.–1 cm. long, leaves membranous or thinly coriaceous, lanceolate with acute base (19) **G. umbrosus**

r. Nerves 10–12 pairs, slightly more prominent, curving with occasionally one secondary nerve between the main ones (20) **G. tavoyensis**

l. Leaves stoutly coriaceous, drying grey beneath, main nerves distinct below, raised, oblique, 16–20 pairs, texture granular like parchment; reticulations not or seldom visible (21) **G. macrophyllus**

(1) **G. subevenius** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 320 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 89 Pl. 121B; Ridley, F.M.P. 1 (1922) 64; Craib, Fl. Siam. Enum. 1 (1925) 51.

Shrub or small tree. *Young branches* slender, puberulous, or sub-coriaceous, later glabrous and striate. *Leaves* membranous, glabrous, narrowly oblong, apex acute, base acute, upper surface shining, drying pale green, the lower paler, dull; main nerves 10–12 pairs, sub-horizontal, faint on both surfaces; reticulations not visible above, very faint below, length 8–11 cm.; breadth 2·5–4·5 cm.; petiole 5 mm. long, glabrous. *Flowers* solitary, axillary. *Pedicels* 1–1·3 cm. long, ebracteate. *Sepals* broadly ovate, bluntly acuminate, 3-nerved, minutely pubescent on both surfaces, 5–7 mm. long. *Petals* thinly coriaceous, puberulous except towards the base inside, lanceolate, sub-acute, 1·8–2·3 cm. long, the inner half as

large. *Stamens* with broad orbicular, sub-convex connectives. *Ovaries* narrowly oblong; style cylindric, curved; stigma subulate entire (may not be fully developed). *Ripe carpels* ovoid to oblong, obtuse, tapering very little at the base, glabrous, 1·3–1·8 cm. long; stalks 1–1·2 cm. long.

PERAK: Kuala Depang, *King 8260* (S., C.) type material; Gopeng, Kinta, *King 4559* (D.D., Kew) type material; G.D., *King 8225* (S., C., Kew) type material.

DISTRIBUTION: Siam.

The material of this species is rather scrappy and inadequate and the flowers young. Close to *G. tenuifolius,* especially the forms with small sepals but the leaves are more coriaceous and the veins much less distinct than in *G. tenuifolius.*

(2) **G. fulvus** Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 75; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 323 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 95 Pl. 134; Ridley, F.M.P. 1 (1922) 68.

Shrub. *Young twigs* dark coloured, at first slightly pubescent, soon glabrous. *Leaves* firmly membranous, dark green and dull above, paler green beneath, oblong to oblanceolate, glabrous, apex rounded and abruptly acute or slightly acuminate, base cuneate, main nerves 14–21 pairs, distinct above, prominent beneath, nearly parallel, oblique, interarching in a bold line near edge, 18–26 cm. long and 6–11 cm. broad; petiole 7 mm.–1 cm. long, glabrous. *Flowers* solitary, axillary. *Pedicels* 5–7 mm. long, adpressed-rusty-pubescent with 3 minute, basal bracts. *Sepals* broadly ovate, obtuse, pubescent outside, glabrous inside, connate at base, 5 mm. long. *Petals* yellowish-red, densely sericeous except at the glabrous base inside, outer linear-lanceolate, tapering to a long slender apex, 1-veined outside, 6–7 cm. long, 5–6 mm. broad at base and 2–3 mm. broad at middle, reddish-pink at base inside; inner ovate, acute 5–6 mm. long, reddish-pink at base inside and outside. *Stamens* numerous, 1·5–2 mm. long with very convex connectives. *Ovaries* 3–4 mm. long, oblong, pubescent, style slender, stigma split down inner side. *Carpels* (probably not quite mature) narrow-cylindric, tapering at each end, dark brown, smooth, glabrous, thin-walled, 3 cm. long and 1 cm. in diam.; stalks 7 mm. long. *Seeds* 1 rarely 2, pointed at each end, testa hairy.

TRENGGANU: S. Nipa by Jeram Gajah, *Kemaman, Corner, 20th November, 1935* (S.); Sri Bangun near Bukit Besi, *Sinclair S.F.N. 39865* (S.).

PAHANG: Rompin, *Soh 15403* (S., K.); *Yeob C.F. Field No. 3176* (S., K., Kew); *Mahamod C. F. Field No. 3723* (S., K.).

MALACCA: *Griffith 400* (C., Kew) type material.

JOHORE: Penyabong, *Foxworthy F.M.S. No. 1189* (S., K.).

DISTRIBUTION: Not known elsewhere.

The stamen connectives are very concave. *G. fulvus* is easily distinguished from the others when not in flower by the dark almost black wood of the twigs and the cuneate base of the leaf. It is common in Trengganu in the forest along the Trengganu-Besut Road.

(3) **G. Holttumii** J. Sinclair, **sp. nov.**

G. montanus Sinclair qui hanc speciem in facie foliorum revocat, nervos pauciores, connectivos apiculatos, carpella non sessilia habet.

Arbor 7–10 m. alta. *Ramuli novelli* glabri, striati. *Folia* tenuiter coriacea, oblongo-lanceolata vel elliptico-lanceolata; breviter acuminata, basi acuta, glabra, supra nitida, 12–15 cm. longa, 3–4·5 cm. lata, petioli 7 mm. longi, glabri; nervi 12–15 pares, tenuissimi, obliqui, interdum vix visibiles; reticulationes fere obscurae. *Flores* solitarii, terminales vel axillares. *Pedicelli* rigidi, 1·2–2 cm. longi, versus apicem sensim crassiores, basi bracteis pluribus minutis praediti. *Sepala* membranacea, oblongo-rotundata, obtusa, glabra, reticulata, 1·8 cm. longa, 1·5 cm. lata. *Petala* coriacea; exteriora oblongo-lanceolata acuminata, puberula, basi truncata, 4·5 cm. longa; interiora ovata, praesertim in marginibus pubescentia, breviter unguiculata, 1·2 cm. longa. *Stamina* 2·5 mm. longa, connectivis convexis. *Ovaria* 5–6 mm. longa, cylindrica; stylus filiformis; stigma anguste-infundibuliforme, in latere adaxiali fissum. *Carpella matura* nigro-brunnea, oblongo-ovoidea, fere obtusa, glabra, 1·8 cm. longa; stipites 1 mm. longi. *Semen* 1.

PAHANG: Fraser Hill upon the Selangor Border, *Burkill* and *Holttum S.F.N. 8896* (S., Kew) holotype and *S.F.N. 7809* (S., K.); Fraser Hill, South ridge, *Nur S.F.N. 11341* (S., Kew).

A mountain species, elevation 4,000–4,370 feet.

(4) **G. Macranii** Craib in Kew Bull. (1922) 167 et Fl. Siam. Enum. (1925) 51; Ast in Suppl. Fl. Gén. L'Indo-Chine (1938) 98.

Small tree 3–7 m. high. *Young twigs* shortly rusty-tomentose, soon becoming puberulous and finally glabrous. *Bark* brownish with a few scattered lenticels. *Leaves* thinly coriaceous, oblong, apex shortly and bluntly acuminate, base acute or sub-acute, glabrous above except the brown-pubescent midrib, slightly rusty-pubescent below on the midrib and nerves, becoming almost glabrous; main nerves 9–18 pairs, often sub-horizontal, fine, curving and anastomosing some distance from the midrib; reticulations very faint or invisible; length 11–15 cm.; breadth 4–8 cm.; petiole

7 mm.–1 cm. long, rusty-pubescent. *Flowers* solitary, axillary. *Pedicels* about 1·5 cm. long, rusty-pubescent with a few minute deciduous bracts at base. *Sepals* ovate, acute, rusty-pubescent outside, glabrous inside, 6 mm. long and 5·5 mm. broad. *Petals* greenish-yellow, 1-veined, coriaceous, outer oblong, acute, rusty-pubescent, claw rather broad, 3·5 cm. long and 1·3 cm. broad; inner sparsely pubescent outside, glabrous inside, 1·1 cm. long.

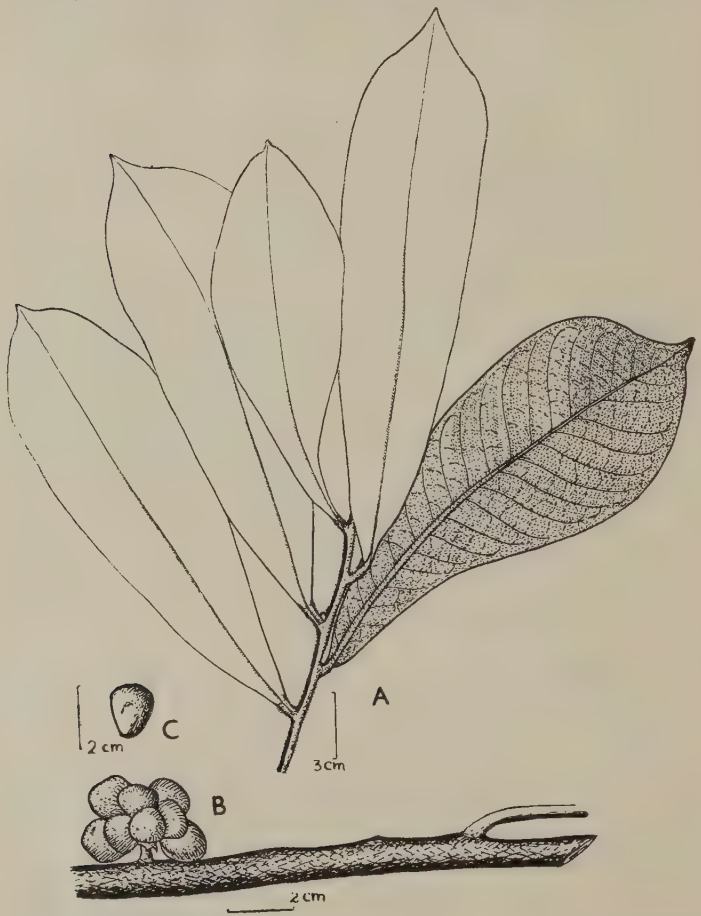


Fig. 40. *Goniothalamus Macranii* Craib.
A, Twig with leaves, shaded leaf is a lower surface view. B, Bunch of fruit. C, Carpel.

Stamens 1·5 mm. long with rounded, convex, pubescent connectives. *Ovaries* 3 mm. long, cylindrical, glabrous; style linear, stigma funnel-shaped, bilobed. *Ripe carpels* orange in sessile clusters of 6–12, obovoid, sparsely brown-pubescent, the pubescence disappearing with age, thin-walled, 2–3 cm. long and 1·4–1·7 cm. broad. *Seeds* 2. **Fig. 40.**

PAHANG: Sungei Kenchin, *Mahamud 15550* (Kew).

SELANGOR: Sungei Lalang F.R., Kajang, *Symington 24165* (K., Kew); Bukit Layang F.R., Ulu Sungei Jinjany, Compt. 17, *Wyatt-Smith 65530* and *65139* (K.).

DISTRIBUTION: Siam.

This species resembles *G. velutinus* (Borneo) and *G. tamirensis* (Indo-China). The former has much larger leaves with more veins. The latter has slightly smaller leaves which are entirely pubescent on the lower surface except the tomentose midrib. Its petals are smaller and acuminate. *G. Macranii* has not previously been recorded for Malaya. It may be that *G. Macranii* is only a form of *G. tamirensis,* that species being somewhat polymorphic but I have not yet decided as this point requires further study.

(5) **G. giganteus** Hk. f. et Th. Fl. Ind. 1 (1855) 109 et in Fl. Br. Ind. 1 (1872) 75; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 322 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 93 Pl. 130; Ridley, F.M.P. 1 (1922) 65; Craib, Fl. Siam. Enum. 1 (1925) 50.

Tree 10–23 m. high. *Young twigs* pale, glabrous, striate. *Leaves* coriaceous, oblong, shortly acuminate, edges slightly recurved, glabrous, upper surface shining, dark brown or with a greenish tint when dry, lower dull; midrib depressed above, sharply angled on lower surface; main nerves 10–14 pairs, fine, raised on both surfaces, interarching 5 mm. from margin and having 1–3 secondary nerves between two main nerves; reticulations faint, forming a loose network; length 16–26 cm.; breadth 4–6 cm.; petiole 7 mm.–1·5 cm. long, deeply channelled. *Flowers* from axils of fallen leaves. *Pedicels* 2·5–4·5 cm. long, stout, 3 mm. thick, pubescent, becoming glabrous, 2 minute bracts at the base. *Sepals* ovate, acute, spreading or recurved, pubescent outside, glabrous inside, 1 cm. long. *Petals* coriaceous, yellow tinged with green; outer broadly ovate to ovate-oblong with a dark, thick, triangular spot at base, acute, minutely pubescent, with 1 main vein and several lateral arising from the base, 8–15 cm. long and 4·5–9 cm. broad, increasing in size as flower opens; inner ovate, acute, shortly clawed, golden-tomentose outside and on the thickened edges, glabrous at the concave base inside, 1·5–2 cm. long. *Stamens* 3 mm. long with flat-topped or convex connectives. *Ovaries* elongate,

rusty-tomentose, 6–7 mm. long, including the slender style; stigma coiled, 2-lobed and slit down inner side; ovules 2. *Ripe carpels* glabrous, oblong, apiculate, tapering into stalk, granular or warted with several faint ridges when dry, 3–4·5 cm. long and 1·5 cm. in diam.; stalks 1 cm. long. *Seeds* 1–2 oblong.

LOWER SIAM: Chawng, *Kiah S.F.N. 24380* (S., K., Kew).

KEDAH: Gunong Raya, Langkawi, *Curtis, September 1890* (S., C.); *Haniff* and *Nur S.F.N. 7169* (S., C., Kew).

PENANG: *Curtis 2162* (C., Kew); *Wall. Cat. 6469A* Porter (C., Kew) as type in Kew.

PERAK: *Scortechini 578b* (S.); *King 10708* (C.); Ulu Kerling, *King 8441* (C., Kew).

PAHANG: Near the Gap towards Raub, *Addison, September 1940* (S.); Ulu Chineras, Kuala Lipis, *Burkill & Haniff S.F.N. 17093* (S., K., Kew).

NEGRI SEMBILAN: Gunong Angsi F.R., *Shaw 23745* (S., K.).

DISTRIBUTION: Siam, Sarawak, Sumatra.

This fine species can easily be recognised by its large flowers and the slightly warted elongate carpels. The leaves are identical with those of *G. malayanus*.

(6) **G. malayanus** Hk. f. et Th. Fl. Ind. 1 (1855) 107 et in Fl. Br. Ind. 1 (1872) 75; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 323 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 94 Pl. 128B; Ridley in Sarawak Mus. Journ. 1/3 (1913) 84 et F.M.P. 1 (1922) 66.

Synonyms: G. dispermus Miq. in Ann. Mus. Bot. Lugd.-Bat. 2 (1865) 34. *G. Slingerandtii* Scheff. in Tijdsch. Ned. Ind. 31 (1870) 341.

Tree or shrub 4–16 m. high. *Young twigs* glabrous, pale, with well-marked striations. *Leaves* coriaceous, oblong to elliptic-oblong, shortly acuminate, base slightly cuneate, edges recurved, glabrous, upper surface shining, dark green, lower dull and paler; midrib sunk above and sharply angled below; main nerves about 16 pairs, faint, raised on both surfaces, anastomosing about 5 mm. from margin, with 1–3 secondary nerves between two main nerves; reticulations faint and lax; length 8–16–(25) cm.; breadth 3–7 cm.; petiole 5 mm.–1 cm. long, deeply channelled. *Flowers* solitary, axillary or from the axils of fallen leaves. *Pedicels* pubescent, 1–1·8 cm. long, slender 1·5–2 mm. thick when dry, 3 mm. thick when fresh, bi-bracteolate at base. *Sepals* ovate-triangular, 3–5 mm. long, connate, pubescent outside, glabrous inside. *Petals* coriaceous, greenish-yellow, lengthening as flower matures; outer, oblong-ovate, acute, minutely pubescent on both surfaces with a

triangular glabrous basal spot on the inside, 1-veined, 3–8 cm. long and 1·5–2·5 cm. broad; inner ovate, acute, shortly clawed, sericeous outside, glabrous and concave inside, 1·2 cm. long. *Stamens* as in *G. giganteus* but shorter, 1·5–2 mm. long. *Ovaries*, style and stigmas as in *G. giganteus;* total length of ovary and style 6–7 mm.; style white. *Ripe carpels* oblong, apiculate, tapering to each end, glabrous, not warted, 2·5–3·5 cm. long and 1·2–1·5 cm. in diam.; stalks 5 mm. long. *Seeds* 2–5, ovoid, shining, brown.

PERAK: *Scortechini, no data* (S., C.); Gopeng, Kinta, *King 4746* (S., C., D.D., Kew); *4722* (C.); Larut, *King 7139* (C., Kew); Batang Padang, *King 8088* (C.).

PAHANG: Kuantan, *Yeob C.F. Field No. 3620* (S., K., Kew); S. Riau, Kuantan, *Mahamud 2797* (K.).

SELANGOR: Kuala Lumpur, native collector, *date 1890* (S.); Bukit Cheraku, *Symington 40756* (K.); Bikum Reserve, Sungkai, *Hashim 364* (K.); Kwang, *Ahmad 13386* (S.); Sungei Tinggi, Kuala Selangor, *Nur S.F.N. 34061* (S., K., Kew).

MALACCA: *Maingay 63* (C., Kew); *Griffith 402* (Kew) type material; Merlimau, *Alvins, 12th December, 1885* (S.); *Alvins 121, no exact loc.* (S.); Sungei Udang, *Goodenough 1364* (S., C.); *Ridley* and *Goodenough 1643* (S.); Ayer Panas, *Goodenough 1291* (S.); Bukit Bruang, *Derry 534* (S.).

JOHORE: S. Sedili Ketchil at Kangkar, *Corner, 1st April, 1934* (S.); *Corner S.F.N. 28604* (S., K., C., Kew); Danau, S. Sedili, *Corner, 27th March, 1932* (S.); Pengkalan Raja, Pontian, *Ngadiman S.F.N. 36775* (S.); 5¼ miles, Kota Tinggi-Mawai Road, *Corner S.F.N. 29307* (S., K., Kew); Sungei Kayu, *Kiah S.F.N. 32156* (S., K., Kew); S. Berassau, Mawai-Jemulang Road, *Corner S.F.N. 28739* (S., K., Kew); Kuala Sembrang, *Lake* and *Kelsall 4039* (S., C.); Sednak, *Ridley, August 1908* (S.).

SINGAPORE: Seletar, *Ridley, April 1894* (S.). Not uncommon in Singapore.

DISTRIBUTION: Sumatra, Sarawak, Borneo, Bangka.

This species is close to *G. giganteus*. I am not able to separate the two if only leaves are present. In *G. giganteus* the pedicels are longer and thicker, the calyx is more deeply cleft, often to the very base and less connate than in *G. malayanus*. The petals are much longer and broader and the stamens twice as long. The carpels of *G. giganteus* are tuberculate and not smooth and have longer stalks (1 cm. long against 5 mm.). The seeds are not flattened and are less shining.

I agree with Airy-Shaw, Kew Bull. (1939) 284–285, in his characters for separating *G. malayanus* from *G. tapis* and find that the following additional character for their separation is reliable:—

Connectives of stamens apiculate in *G. tapis* and flat-topped to convex in *G. malayanus*.

(7) **G. undulatus** Ridley in Journ. Fed. Mal. States Mus. 10 (1920) 81; Craib, Fl. Siam. Enum. 1 (1925) 51.

Synonym: G. latestigma Fischer in Kew Bull. (1927) 204 Fig. in text.

Shrub 2–6 m. high. *Youngest branches* dark brown-pubescent, older dark, glabrous, striate. *Leaves* membranous, oblong or oblong-lanceolate, shortly and bluntly acute, base acute, margin undulate, glabrous except the pubescent midrib beneath; main nerves 11–15 pairs, faint or indistinct above, fine beneath, ascending, not very straight, interarching 5–7 mm. from margin, reticulations faint and lax; length 12–16 cm.; breadth 4–5·5 cm., not varying much in width along the entire length; petiole 7 mm.–1 cm. long, pubescent. *Flowers* solitary, axillary. *Pedicels* 5 mm.–1 cm. long, brown, pubescent, with several deciduous bracts at base. *Sepals* ovate, acute, membranous, rusty-pubescent outside, glabrous inside, 7 mm. long. *Petals* coriaceous, greenish-yellow, acute, 1-veined, pubescent; outer ovate-lanceolate, clawed, 2·5 cm. long and 1·2 cm. broad; inner half as long, triangular. *Stamens* numerous, 2 mm. long with convex or flat-topped connectives. *Ovary* 4 mm. long, pubescent; style linear, stigma funnel-shaped, bi-lobed, split on the inner side. *Ripe carpels* ovoid, apiculate, glabrous, thin-walled, 1–1·5 cm. long; stalks 1 cm. long. *Seeds* 1, occasionally 2.

Lower Siam: Tasan, *Kloss F.M.S. Mus. Herb. 6836* (S., Kew) type; Tasan Champlon, *Hamid C.F. 3855* (S., K., Kew); Chantaboon, *Vesterdal 4–2* (S.); Huay Mut, *Kiah S.F.N. 24399* (S., K., Kew); Hngop. *Haniff* and *Nur S.F.N. 4037* (S., C., Kew).

Kelantan: Bukit Bayor, *Hamid 33457* (K.).

Distribution: Lower Burma.

This species is close to *G. tenuifolius* but the leaves are usually more undulate along the margins than the latter. The petals are much thicker in *G. undulatus,* the sepals not quite so large or broad as in the typical forms of *G. tenuifolius.* The carpel stalks are longer in *G. undulatus.*

(8) **G. tenuifolius** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 320 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 89 Pl. 122A; Ridley, F.M.P. 1 (1922) 64.

Synonyms: G. Kunstleri King, Mat. F.M.P. Vol. 1 No. 4 (1892) 322 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 90 Pl. 124; Ridley, F.M.P. 1 (1922) 67. *G. caudifolius* Ridley in Kew Bull. (1914) 324 et F.M.P. 1 (1922) 65.

Shrub or small tree 2–7 m. high. *Young twigs* slender, pubescent, later glabrous and striate. *Leaves* membranous, varying considerably in shape and size, lanceolate or oblong lanceolate, acuminate, base acute, rarely rounded, the margins sometimes slightly undulate, glabrous or pubescent on the midrib and veins beneath; main nerves 8–11 pairs, fine, curving and interarching 5 mm. from margin; reticulations faint and lax; length 8–18·5 cm.; breadth 2–6 cm.; petiole 5–8 mm. long, glabrous or pubescent. *Flowers* solitary, axillary, pendulous. *Pedicels* 5 mm.–2 cm. long, glabrous or pubescent with 2–3 minute bracts at base. *Sepals* ovate, acute or acuminate, membranous, several-nerved and reticulate, persistent, varying much in size, 7 mm.–2·7 cm. long and 6 mm.–2·2 cm. broad. *Petals* yellowish to pinkish, thinly coriaceous, pubescent, outer broadly lanceolate, acuminate, much contracted at the base, varying much in length with age, 2–3 cm. long, inner ovate, acuminate, 1 cm. long or less. *Stamens* 2 mm. long, numerous with flat-topped or convex connectives. *Ovaries* about 3 mm. long, narrow; style filiform, stigma funnel-shaped, split down the inner side. *Ripe carpels* ovoid, slightly apiculate, pubescent or glabrescent, 1–1·2 cm. long; stalks 4–5 mm. long. *Seeds* 1 rarely 2.

DISTRIBUTION: Herbarium specimens from all states except Perlis, Malacca, Johore and Singapore. Not known outside Malaya.

A variable species with regard to length of pedicels, sepals and petals and to breadth and pubescence of leaves. There are forms with very short pedicels, 5 mm. long or less, some with intermediate pedicels and others with pedicels up to 2 cm. long. Those with long pedicels usually have large sepals but this is not always the case. They may have very small ones. The length of the petals depends mostly on the age of the flower. The presence or absence of the pubescence on the lower surface of the leaves does not bear any relation to length of sepals or pedicels.

King's *G. Kunstleri* tends to have very short pedicels and small sepals and I can not see that is really a distinct species. On account of the variability of the pedicels and sepals and the fact that their lengths are not co-related with each other, I have meantime included *G. Kunstleri* and *G. caudifolius* in *G. tenuifolius*.

(9) **G. rotundisepalus** Henderson in Gard. Bull. Str. Settl. Vol. 4 No. 1 (1926) 48.

Shrub 1–2 m. high. *Youngest twigs* slightly reddish, pubescent, soon glabrous, dark coloured and striate. *Leaves* membranous, oblong, elliptic-oblong or ovate-oblong, bluntly acuminate, base acute, glabrous, dull when dry; main nerves 7–9 pairs, very faint above, more distinct beneath, curving, interarching 5–7 mm. from

margin; reticulations indistinct; length 14–23 cm.; breadth 4·5–8·5 cm.; petiole 8 mm.–1·3 cm. long, glabrous. *Flowers* solitary, axillary. *Pedicels* 4–5 mm. long (fruiting about 8 mm.) slender, reddish-puberulous with 4 ovate, acute, red, pubescent bracts 2–3 mm. long. *Sepals* rotund or obtusely pointed at the apex, persistent, glabrous or sparsely pubescent outside, 4–5 mm. long. *Petals* thinly coriaceous, pale green, slightly reddish, pubescent on both sides, outer broadly lanceolate, acute, narrowed to the truncate base, 1-veined, 2·5 cm. long and 1 cm. broad; inner ovate, clawed, more pubescent than the outer, 1·2 cm. long and 7 mm. broad. *Stamens* numerous, 2 mm. long with orbicular, convex, pubescent connectives. *Ovaries* 3 mm. long, linear-oblong, reddish-pubescent; style linear, stigma funnel-shaped with 2 thick lobes, split down the inner side. *Ripe carpels* globular to ovoid, slightly apiculate, black when dry, 1-seeded, 9 mm. long and 7 mm. in diam; stalks 3–4 mm. long.

KELANTAN: Sungei Renong, *Nur* and *Foxworthy S.F.N. 12157* (S., Kew) type material; Chaning, *Ridley, January 1917* (S., Kew); Gunong Stong, *Symington 37608* (S.).

DISTRIBUTION: No other localities.

This species is very close to *G. tenuifolius* especially the forms with small sepals and short pedicels. The leaves are not undulate at the margins as they sometimes are in *G. tenuifolius* and they are of a more granular, parchment-like texture. The rotund sepals provide the best distinguishing character. The fruit of both is very similar.

(10) **G. tortilipetalus** Henderson in Gard. Bull. Str. Settl. Vol. 7 No. 2 (1933) 88 Pl. 15.

Tree about 6 m. high. Young twigs glabrous, dark coloured, striate. *Leaves* coriaceous, oblong to oblong-ovate or slightly oblong-obovate, shortly and bluntly acuminate, base cuneate, edges slightly recurved, glabrous, greenish-brown and shining above when dry, pale brown below, both surfaces with minute pale brown or black glandular dots; main nerves about 15–20 pairs, slender, raised on both surfaces, anastomosing about 5 mm. from margin; reticulations with wide meshes, more distinct above than below; length up to 33 cm.; breadth 9·5–10·5 cm.; petiole stout, 1–1·3 cm. long. *Flowers* single or in groups from woody tubercles on the main stem. *Pedicels* 3 cm. long, thickening towards base of calyx, glabrous, with 3–4 minute, obtuse bracts at the base. *Sepals* 3 cm. long and 2·8 cm. broad, triangular-ovate, slightly coriaceous, united at the very base, nearly glabrous except for a few glandular hairs on the margins and apex. *Petals* greenish, coriaceous, outer

8·8 cm. long and 3·1 cm. broad, lanceolate, tapering gradually and ending in a blunt point, slightly twisted, both surfaces with a few minute glandular hairs, one main vein and several faint lateral ones arising from base; inner 2 cm. long, oblong-lanceolate, coriaceous, united by the margin above the claws. *Stamens* 4 mm. long, incurved with apiculate connectives. *Ovaries* linear-oblong, adpressed-tomentose with filiform style tapering to a fine point; total length about 7 mm. *Carpels* numerous, globular, thin-walled, blunt, slightly granular, 1·5 cm. long and 1·2 cm. in diam.; stalks 7 mm.–1 cm. long. *Seed* 1, pale brown, smooth, filling the carpel.

LOWER SIAM: Bacho, *Kiah S.F.N. 24290* (S., K., Kew).

PERAK: Kota Lama, Kuala Kangsar, *Haniff S.F.N. 15552* (S.); Lumut, *Ridley, date 1899* (S.).

PAHANG: Tembeling, *Henderson S.F.N. 24543* (S., Kew) type; Rotan Tunggal Res., Raub, *Osman 28540* (K.); Kemansul F.R., *Ahmad 40406* (K.).

MALACCA: Batu Tiga, *Goodenough 1392* (S.).

DISTRIBUTION: No other collections at the time of writing.

This species like *G. Ridleyi* is cauliflorous but the latter is easily distinguished from it by the much thinner leaves with very prominent oblique veins and the very different flowers and fruits. The larger petals recall those of *G. giganteus* but in *G. giganteus* they are larger still with the sepals only 1 cm. long and not 3 cm. long with a distinct network of veins as in the present species. The anther connectives are apiculate while they are flat-topped or convex in *G. giganteus*.

(11) **G. Ridleyi** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 325 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 98 Pl. 138; Merrill in Journ. Roy. As. Soc. St. Br. (1921) 260; Ridley F.M.P. 1 (1922) 68.

Synonyms: G. Prainianus King, Mat. F.M.P. Vol. 1 No. 4 (1892) 321 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 90 Pl. 123.

Tree 7–23 m. high. *Young twigs* slightly pubescent, dark brown, later paler and glabrous, lenticellate. *Leaves* firmly membranous, oblong or oblong-obovate, apex rounded and then acute or shortly and abruptly acuminate, base acute, upper surface glabrous, the lower slightly pubescent becoming glabrous; nerves 16–24 pairs, opposite or alternate, parallel, oblique, prominent on both surfaces, interarching 3 mm. from margin; reticulations lax, one series scalariform but often not very straight; the second less distinct, interspersed irregularly among the first series; length 15–30 cm.; breadth 5–8·5 cm.; petiole 1·5–2 cm. long, slightly pubescent, stout, grooved. *Flowers* in fascicles from warty tubers at base of

trunk. *Pedicels* 9–13 cm. long, with several minute, obtuse bracts at base. *Sepals* coriaceous, glabrous, greenish-yellow outside, pinkish inside, broadly ovate-elliptic, obtuse, several-nerved, united only at the very base, 2·3–2·5 cm. long and 1·2 cm. broad. *Petals* coriaceous; *outer* elliptic-oblong, slightly obtuse to acute, the edges slightly inrolled, greenish-yellow outside, yellowish-pink inside, glabrous or slightly puberulous, with one main vein and several finer ones, pink in colour, clawed at base, 4–4·5 cm. long; *inner* obovate, apiculate, pink, with a narrow claw, the edges closely adhering, length about 2·3 cm. *Stamens* yellow, 2–3 mm. long with apiculate connectives. *Ovaries* oblong, glabrous, 2 mm. long; styles white, linear 3 mm. long; stigmas funnel-shaped, split on inner side, the groove continued down the style. *Ripe carpels* very numerous, obovoid, tapering slightly into the short stalk, glabrous, thin-walled, 2·4 cm. long and 1·8–2 cm. in diam.; stalk 5 mm.–1 cm. long. *Seed* single, pale brown, slightly hairy.

KEDAH: B. Blakang Parang, Gunong Bintang, *Haniff S.F.N. 21042* (S.).

PERAK: *Scortechini 1576* (C.); Piah F.R., *Ja'amat* and *Tachun 39297* (S., K.); Gunong Tungul, *Ridley 7997* (S., C.); Chanderiang, *King 5745* (S., C., Kew); Gunong Bubu, *King 8348* (S., C., Kew); Upper Perak, *Wray 3454* (S., C., Kew); Batu Kurau, (S., C.); Jor, *Haniff S.F.N. 14210* (S., Kew); Kati, Kuala Kangsar, *Haniff S.F.N. 14938* (S.); Gunong Tungul, *Ridley 7997* (S., C.); Ulu Temango, *Ridley 14597* (S.); Batu Kurau, *Curtis 2893* (K.).

TRENGGANU: Ulu Brang, *Moysey* and *Kiah S.F.N. 33346* (S., K., Kew).

PAHANG: Bukit Goh F.R., Kuantan, *Foxworthy C.F. 3131* (K.); Ulu Liang, Raub, *Strugnell 20443* (K.).

SELANGOR: 15th mile Pahang Track, *Ridley 8781* (S.).

MALACCA: Sungei Udang, *Derry 100* (S.).

JOHORE: Ulu Segun, Gunong Panti, *Corner S.F.N. 30869* (S., K., Kew); Sungei Kayu, *Kiah S.F.N. 32345* (S., K., Kew).

SINGAPORE: Mandai Forest, *Corner, 26th January, 1930* and *14th September, 1930* (S.); Bukit Timah, *Ridley 4456* (S., C.); *6353* (S., C.); *Nur S.F.N. 24636* (S., C., K., Kew); Sungei Buloh, *Ridley 6227* (S., C.); Chan Chu Kang, *Ridley, date 1892* (S., C.); Sungei Murai, *Goodenough 2118* (S., C., Kew) type material.

DISTRIBUTION: Sarawak and Borneo.

This cauliflorous species is not likely to be confused with any of the other Malayan species.

(12) **G. Wrayi** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 327et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 99 Pl. 142; Ridley. F.M.P. 1 (1922) 65.

Shrub 1–4 m. high. *Young twigs* glabrous, pale, closely striate. *Leaves* firmly membranous, lanceolate to oblanceolate, drying pale grey-green, glabrous, shortly and bluntly acuminate, base cuneate, main nerves 14–20 pairs, oblique, spreading, slender, faint above,

distinct below, reticulations faint on both surfaces; length 10–27 cm.; breadth 3·5–6 cm.; petiole 7 mm. long. *Flowers* solitary, axillary. *Pedicels* pubescent, decurved, 7 mm.–1 cm. long with 3–5 minute bracts arranged in two rows. *Sepals* membranous, faintly nerved, ovate, acuminate, puberulous outside, glabrous inside, united at base, persistent, 5–7 mm. long. *Petals* coriaceous, greenish-yellow, puberulous; outer lanceolate, acuminate, the base not clawed, 1·5–2 cm. long; inner ovate, acuminate, clawed, about 1 cm. long. *Stamens* 2·5 mm. long with apiculate connectives. *Ovaries* narrowly cylindric, rusty-pubescent; style pubescent, filiform; stigma funnel-shaped; total length of style and stigma 3 mm. *Ripe carpels* obovoid to oblong, apiculate, narrowed into the short stalk, glabrous, 1·2 cm. long; stalks 3–4 mm. long. *Seeds* 1, rarely 2.

PERAK: *Scortechini 36* (S., C.); *Wray 157* (S.); *King 10512* (C., E., Kew); *10768* (C.); Ulu Kerling, *King 8753* (S., C.); Larut *King 3083* (C.); *4202* (C.); *7537* (C., E.); *1826* (C., D.D.); Relau Tujor, *Wray 2906* (S., C.); Gunong Batu Puteh, *Wray 437* (S., C.); *Wray 987* (S.); *Wray 1017* (Kew); Taiping, *Wray 1822* (S.); Tapah, *Ridley 14095* (S., C.).

SELANGOR: Kanching F.R., *Cubitt 11204* (S., K., Kew); Semenyih, *Hume 7829* (S.); Ulu Gombak, *Hume 8510* (S.); S. Lalang F.R., Kajang, *Symington 22801* (K.).

DISTRIBUTION: Sumatra. Type material Perak, Wray, Scortechini and King's numbers.

This species has narrow petals like *G. fulvus* but the pale twigs will at once distinguish it. The pale colour of the leaves when dry, the small sepals and the apiculate stamens are also good diagnostic characters.

(13) **G. Curtisii** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 324 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 96 Pl. 135; Ridley, F.M.P. 1 (1922) 68.

Small tree 6–10 m. high. *Young twigs* dark chocolate-tomentose, older glabrous and pale, closely striate. *Leaves* firmly membranous, narrowly oblong to obovate-oblong, shortly acuminate, slightly narrowed to the rounded base, shining and glabrous above except the puberulous midrib, the lower sparsely pubescent, dark chocolate-tomentose on the midrib; main nerves 28–36 pairs, sub-horizontal, parallel, prominent forming a conspicuous and continuous line of interarching round margin; reticulations faint above, distinct below, some of them scalariform; length 27–50 cm.; breadth 7–16·5 cm.; petiole tomentose like the midrib. *Flowers* solitary in the axils of fallen leaves. *Pedicels* pubescent, decurved, 1 cm. long with 3 minute, basal bracts. *Sepals* leaf-like, green, several-nerved, broadly ovate, sub-acute, united in a cup at

the base, minutely pubescent, persistent, 1·5–2 cm. long and 1·5 cm. broad. *Petals* thinly coriaceous, velvety-tomentose, yellowish tinged with red, outer lanceolate, acuminate, 1-veined, narrowed to a small claw, 3–4·5 cm. long and 1·3 cm. across the middle; inner ovate, acute, about 1 cm. long. *Stamens* 4 mm. long with pubescent apiculate connectives; pollen grains large. *Ovaries* 4 mm. long, elongate, cylindric, pubescent, styles filiform, glabrous, stigma funnel-shaped and split down inner side, two-lobed, the lobes obtuse and slightly pubescent. *Ripe carpels* obliquely ovoid, acute at apex, rufous-pubescent, 1·8 cm. long; stalks 3 mm. long. *Seed* single.

PERAK: *Scortechini 660b* (S., C.) type material; near Ulu Kerling, *King 8639* (S., C., Kew); Ulu Bubong, *King 10548* (C., D.D.) type material; Trolak F.R., *Tachun 43467* (K.).

PAHANG: Fraser Hill on Selangor Border, *Nur S.F.N. 11191* (S., K., Kew); Bentong, *Ahmad C.F. Field No. 5051* (S., K., Kew); Karak F.R., Bentong, *Best S.F.N. 13895* (S.).

SELANGOR: Ulu Gombak, *Strugnell 12135* (S., K.); *Hume 9088* (S.) and *9257* (S.); *Ridley F.M.S. Museums Herb., 20th December, 1920* (S.); Batu Caves Estate, *Ridley 8276* (S., Kew); 15th mile Pahang Track, *Ridley 8627* (S.); Kuala Lumpur, *Curtis 2316* (S.) type material; *Mat 2120* (S., C., Kew); Gua Batu, *Curtis 310* (S., C.) type material; Kampong Kerling, *Ridley 10625* (S.); Ginting Simpah, *Symington 29811* (K.); *Nur S.F.N. 34277* (S.); Kepong Plantations, *Sow 17031* (K.); Sungei Lalang F.R., *Symington 22611* (K.); Ulu Langat, *Kloss* February 1912 (Kew).

DISTRIBUTION: Not known outside the Peninsula.

This species has the large sepals of *Scortechinii* and *calycinus* but the tomentose midrib on the lower surface of the leaves at once distinguishes it from these. *G. calycinus* has longer pedicels than *Curtisii*.

(14) **G. calycinus** J. Sinclair, **sp. nov.**

Haec species *G. Curtisio* King et *G. Scortechinio* King affinis, sed differt ab utroque pedicellis longioribus; a priore foliis minoribus et glabris, ramulis non nigro-brunneis, nervis paucioribus et magis obliquis; ab altera foliis oblongo-obovatis a medio latioribus, linea anastomosanti nervorum magis distincta.

Arbor parva, 5–7 m. alta. *Cortex* pallidus, pustulatus. *Ramuli novissimi* rubro-pubescentes, mox glabri. *Folia* valde membranacea, oblonga vel oblongo-obovata abrupte et breviter acuminata, basin versus acutam sensim angustata, glabra 19–34 cm. longa, 8·5–12 cm. lata; petioli 1–1·2 cm. longi, puberuli vel glabrescentes; nervi 20–25 pares, paralleli, obliqui, supra aliquando depressi subtus prominentes, in linea conspicua et integra prope marginem anastomosantes; reticulationes inter nervos scalariformiter dispositae. *Flores* penduli, solitarii, axillares. *Pedicelli* 2–3 cm. longi.

tenues, nitidi pubescentes, 4–6 bracteis minutis lanceolatis acutis ordinibus duobus basi praediti. *Sepala* late-ovata, membranacea, pluri-nervata, obtusa, persistentia, marginibus sparse pubescentia, a basi conjuncta, 1·5–1·8 cm. longa, 1·5–1·8 cm. lata. *Petala* virido-flava, coriacea, pubescentia acuta, 1-nervosa, exteriora ovato-oblonga vel oblongo-lanceolata, acuta, 3–3·6 cm. longa, 1–1·8 cm. lata; interiora ovata, 1·5 cm. longa. *Stamina* 4 mm. longa, connectivis apiculatis pubescentibus. *Ovaria* 5–6 mm. longa, cylindrica, pubescentia; stylus filiformis glaber; stigma infundibuliforme, bilobatum, pubescens, latere adaxiali fissum. *Carpella matura* ovoidea, apiculata, primum puberula, deinde glabra, 1·5–1·7 cm. longa, 9 mm. diam.; stipites 3–5 mm. longi. *Semen* unum.

TRENGGANU: Bukit Kajang, Kemaman, *Corner S.F.N. 30317* (S.) holotype; *Corner S.F.N. 25939* (S., Kew); Ulu Bendong, Bukit Kajang, *Corner 30128* (S.); Ulu Brang, *Moysey* and *Kiah S.F.N. 33741* (S.) and *S.F.N. 33642* (S.).

DISTRIBUTION: Not known so far from any other locality.

The longer flowering pedicels at once distinguish this species from *G. Curtisii* and *G. Scortechinii* but the leaf-like, several-veined calyx is rather similar.

(15) **G. Scortechinii** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 326 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 99 Pl. 141; Ridley, F.M.P. 1 (1922) 67.

Shrub or small tree 2–7 m. high. *Young twigs* glabrous, pale, closely striate. *Leaves* firmly membranous, oblanceolate or oblong-oblanceolate, apex rounded and then very shortly acuminate, base acute, glabrous on both surfaces, the upper surface drying pale green, the lower pale brown; main nerves 18–24 pairs, prominent, oblique, straight; nearly parallel, interarching near margin but the line of interarching less distinct than in *G. Curtisii;* reticulations faint above, fine beneath, some of them scalariform; length 18–34 cm.; breadth 6–9 cm.; petiole 1–1·5 cm. long, glabrous. *Flowers* mostly solitary from the axils of fallen leaves but occasionally in pairs. *Pedicels* about 1·5 cm. long, thickened at base of calyx, decurved, with 3 minute bracts at base. *Sepals* leaf-like, orbicular-ovate, sub-acute, with several nerves, united at base, persistent, 1·8–2·6 cm. long and 1·4–2·4 cm. broad across the middle. *Petals* coriaceous, dull pink, puberulous, the outer, oblong, acute with short claws, one-veined, 2·3–3 cm. long, the inner ovate, acute, clawed, 1·2 cm. long. *Stamens* 4–5 mm. long with apiculate, pubescent connectives. *Ovaries* 4 mm. long, cylindric, rusty-pubescent; style filiform, stigma funnel-shaped with a split down inner side, 2-lobed. *Ripe carpels* ovoid-oblong, apiculate, glabrous, thin-walled, narrowed to the stalk, 1·5–1·8 cm. long

and 8 mm.–1 cm. in diameter; stalks 5 mm.–1 cm. long. *Seeds* 1–2, pale, smooth.

KELANTAN: Bukit Batu Papan, S. Lebir, *Henderson S.F.N. 29522* (S., K., Kew).

PENANG: Government Hill, *Curtis 3563* (S., Kew).

PROVINCE WELLESLEY: Bukit Juru, *Curtis, June 1890* (S.).

PERAK: *Scortechini 1151* (C.); Waterloo, *Curtis 2706* (S.); Kertai Reserve, Temango, *Ridley 14596* (S.); Kati, Kuala Kangsar, *Haniff S.F.N. 14944* (S.); Gunong Kerbau, *Haniff 4006* (S.); Grik, *Burkill* and *Haniff S.F.N. 13764* (S.); *S.F.N. 12349* (S.) and *S.F.N. 13753* (S.); Upper Perak, *Wray 3801* (S., C.); *3749* (S., D.D., Kew); *3685* (S., C.); Larut, *King 7448* (C., Kew); *5228* (C., D.D.); Gunong Pondok, *King 8292* (C., Kew); Gopeng, Kinta, *King 7079* (C.); Bukit Kamuning, *Ridley, February 1904* (S.); B. Kapayany, *Ridley, February 1904* (S.); Gunong Tungal, *Ridley 7994* (S.).

PAHANG: S. Jelei, *Machado, May 1903* (S.); Kuala Teku F.R., *Sow 41045* (K.); Ulu Lemoi, *Ja'amat 28286* (K., Kew) and *Dolman 28287* (K., Kew).

SELANGOR: Ginting Bidai, *Ridley 7282* and *7283* (S.).

DISTRIBUTION: Siam. Type material, Perak, Scortechini, King and Wray's numbers.

The colour of the leaves when dry recalls those of *G. Wrayi* which however has smaller leaves. The large leaf-like sepals resemble those of *G. calycinus* and *G. Curtisii* both of which have large leaves with numerous nearly parallel veins. In *calycinus* the leaves are oblong-obovate, much wider especially at the middle while the line of interarching of the veins is much more distinct. The flowering pedicels too are much longer, up to 3 cm. and the petals are more pubescent. *G. Curtisii* is at once recognized by the dark chocolate pubescence of the young twigs and lower midrib, the more numerous and sub-horizontal nerves with their very distinct line of interarching. Further the leaves of both these species do not turn pale when dry. There should be no difficulty in distinguishing these three species.

(16) **G. uvarioides** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 327 et Ann. Roy. Bot. Gard. Calc. 4 (1893) 100 Pl. 143; Ridley in Sarawak Mus. Journ. 1/3 (1913) 85 et F.M.P. 1 (1922) 69; Merrill in Journ. Roy. As. Soc. Str. Br. (1921) 261.

Synonym: G. pendulifolius Ridley, F.M.P. 5 (1925) 287.

Shrub 3–5 m. high. *Young twigs* glabrous, pale, striate. *Leaves* firmly membranous to subcoriaceous, oblong to slightly obovate, apex acute, base slightly acute to rounded, both surfaces glabrous; main nerves 25–33 pairs, nearly parallel, oblique, prominent on both surfaces, interarching near edge, reticulations faint above, lax beneath, some scalariform; length 25–47 cm.; breadth 7·5–15 cm.; petiole 1 cm. long, stout, glabrous. *Flowers* solitary from

axils of fallen leaves on the older branches. *Pedicels* recurved, stout, glabrous, 7 mm. long with 2–3, minute, basal bracts. *Sepals* coriaceous, semi-orbicular, blunt, glabrous or with a few scattered hairs on the edges, several-veined, united above base, 1·2 cm. long and 7 mm. broad. *Petals* coriaceous, yellow, outer oblong-lanceolate, acute, thickened and truncate at base, minutely pubescent, 4·5 cm. long; inner oblong-elliptic, pubescent, clawed, 2 cm. long. *Stamens* 4–5 mm. long with apiculate, pubescent connectives. *Ovaries* 2 mm. long, rusty-pubescent; style 3 mm. long, linear, grooved; stigma funnel-shaped, split down inner side. *Ripe carpels* oblong, apiculate, the base narrowed, glabrous, 4–5·3 cm. long and 1·8 cm. in diam.; stalks 2·5 cm. long. *Seeds* 4–5, pale brown.

KEDAH: Gunong Lang near Baling, *Kiah S.F.N. 35023* (S.).

PERAK: Chenderoh F.R., *Ja'amat 39202* (S., K.); Ulu Slim, *King 10664* (Kew., C.) type material, fruiting; Ulu Bubong, *King 10126* (C.) type material, fruiting.

PAHANG: Kelau State Land, Raub, *Osman 28471* (K.); 6 miles north of Bentong, *Burkill* and *Haniff S.F.N. 16501* (S., Kew) type of Ridley's *G. pendulifolius*.

SELANGOR: Sungei Lalang, Kajang, *Symington 22713* (S., K.).

DISTRIBUTION: Sarawak and Borneo. *Motley 960 from Borneo type material, flowering.*

I cannot distinguish between Ridley's *G. pendulifolius* and this species and so have united them.

(17) **G. montanus** J. Sinclair, **sp. nov.**

Inter species malayanas connectivis staminum apiculatis praeditas haec species pedicellis terminalibus longissimis tenuissimisque differt. *G. Holttumii* Sinclair qui hanc specimen in facie foliorum revocat, connectiva convexa habet.

Frutex vel *arbor* 7 m. alta. *Ramuli novelli* glabri, striati. *Folia* tenuiter coriacea, oblongo-lanceolata, breviter acuminata, basi acuta, glabra, 12–17·5 cm. longa, 3·5–5·5 cm. lata; petioli 7 mm.–1 cm. longi, glabri; nervi 8–9 pares, utrinque non prominentes, fere obscuri. *Flores* solitarii, axillares vel terminales. *Pedicelli* glabri tenues, 3·5–5·5 cm. longi bracteis pluribus minutis basi praediti. *Sepala* ovata, acuta, omnino libera, extus minute pubescentia, 4–5 mm. longa. *Petala* tenuiter coriacea, sub anthesin longitudine crescentia; exteriora lanceolata, acuminata, minute pubescentia 1-nervosa, breviter unguiculata, post anthesin 3·5 cm. vel plus longa, circiter 1 cm. lata; interiora praesertim in marginibus pubescentia, 1 cm. longa. *Stamina* 2·5 mm. longa, connectivis apiculatis. *Ovaria* 3 mm. longa, cylindrica, pubescentia; stylus

filiformis; stigma infundibuliforme, latere adaxiali fissum. *Carpella* matura oblonga, obtusa, glabra, 1·8 cm. longa, 1·4 cm. in diam.; stipites 8 mm. longi. *Semen* 1.

TRENGGANU: Ulu Brang, Tersat, *Moysey S.F.N. 33627* (S.) holotype.

PAHANG: Cameron Highlands, Ulu Wi, *Ja'amat 35949* (K.) and *37520* (K.).

A mountain species, elevation 2,500 feet.

(18) **G. tapis** Miq. Fl. Ind. Bat. Suppl. 1 (1861) 371 et in Ann. Mus. Bot. Lugd.-Bat. 2 (1865) 35; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 326 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 99 Pl. 140; Ridley in Sarawak Mus. Journ. 1/3 (1913) 84 et F.M.P. 1 (1922) 67; Airy-Shaw in Kew Bull. (1939) 284; Corner, Wayside Trees of Malaya 1 (1940) 134 Text-fig. 36.

Tree or shrub 3–10 m. high with smooth grey bark. *Young twigs* glabrous, brownish or pale, striate. *Leaves* coriaceous, oblong to elliptic-oblong, abruptly, shortly and bluntly acuminate, base rounded or slightly cuneate, edges recurved when dry, both surfaces dull, glabrous, brown when dry; midrib sunk above, terete, prominent beneath and slightly rough; main nerves about 16 pairs, slender and faint but raised on both surfaces, spreading with 1–3 secondary nerves between the main ones; reticulations faint and lax; length 15–27 cm.; breadth 6–12 cm.; petiole 5–7 mm., stout, channelled. *Flowers* solitary, occasionally in pairs, axillary, fragrant. *Pedicels* with 3–4, minute, basal bracts, stouter than in *G. malayanus,* broadening towards calyx, 5 mm.–1 cm. long. *Sepals* green, sometimes tinged with purple, ovate, acute, free to base, pubescent outside, glabrous inside, 5–6 mm. long. *Petals* coriaceous, pubescent to glabrous, greenish, later creamy-white, often tinged with pink, outer ovate-lanceolate, sharply acuminate, contracted and thickened at base, one-veined outside, 3–5 cm. long; inner ovate, acute, clawed, 1–1·7 cm. long. *Stamens* 2·5 mm. long with apiculate connectives and large pollen grains. *Ovaries* 3 mm. long, elongate, tomentose; style filiform, stigma funnel-shaped with the two lobes of the funnel-mouth split down the inner side. *Carpels* ripening red, then purple and finally black, ellipsoid, apiculate, glabrous, thin-walled, sessile, 1–1·2 cm. long, 1-seeded.

KELANTAN: Kota Bahru, *Corner S.F.N. 33403* (S.); *Gimlette, 7th May, 1913* (S.).

PENANG: West Hill, *Curtis 302* (S., Kew); ravine on hillside above Telok Aling, *Sinclair S.F.N. 39381* (S.).

PERAK: *Scortechini, no data* (S., C.); *Scortechini 172b* (Kew): Gopeng, Kinta, *King 4334* (S., C.); *4626* (S.); Larut, *Wray 2415* (S., C.); *3996* (S., C.); *King Nos. 3699* (C., E.); *6527* (C., Kew); *1973* (C., D.D., Kew); *5882* (C.); *5105* (Kew); Assam Kumbong, *Wray*

2926 (S., C.); Pengkalan Bahru, Pangkore, *Curtis 1634* (S., Kew); 44th mile, Bruas, *Burn-Murdoch 254* (S.).

TRENGGANU: Ulu Bendong, Kajang, Kemaman, *Corner S.F.N. 30018* (S.).

JOHORE: 6th mile Mawai Road, *Corner, 15th April, 1936* (S.); Gunong Pulai, *Nur* and *Kiah S.F.N. 7774* (S.); S. Kayu Ara, Mawai-Jemeluang Road, *Corner, 11th May, 1935* (S.); Muar, *Curtis, April 1901* (S.); Biawak, *Curtis 3624* (S.).

SINGAPORE: Woodlands, *Ridley, date 1900* (S.); Chan Chu Kang, *Ridley, April 1894* (S.); Bukit Timah, *Ridley 8405* (S.); Pulau Damar, *Ridley 6757* (S.); Seletar, *Mat, date 1894* (S.); Jurong, *Mat, date 1894* (S.).

DISTRIBUTION: Sarawak, Sumatra.

This species is easily distinguished from *G. malayanus* by its broader leaves, shorter pedicels, the more acute petals, the apiculate connectives of the stamens and the one-seeded, ellipsoid carpels. See notes under *G. malayanus* and also see Airy-Shaw in Kew Bull. (1939) 284. *G. tapis* is often seen flowering when only 3–4 feet high.

(19) **G. umbrosus** J. Sinclair, **sp. nov.**

Foliis angustioribus, lanceolatis, magis coriaceis basi magis acutis, carpellis stipitatis a *G. tape* differt.

Frutex ad 3 m. altus. *Ramuli* graciles, glabri, albo-grisei, minute striati. *Folia* 14–18 cm. longa, 4–5 cm. lata, lanceolata, glabra, membranacea, supra nitida, atro-viridia, subtus pallidiora, apice acuta vel acuminata, basi acuta; nervi 14–16 pares graciles et obscuri, secondariis inter primarios dispositis; petioli graciles, profunde canaliculati, 8 mm. longi. *Flores* flavo-virides. *Pedicelli* 6 mm. longi, tribus bracteis basi praediti. *Sepala* triangularia, acuta, glabra, 3 mm. longa, *Petala exteriora* 4–4·5 cm. longa, 1·2 cm. lata, lanceolata, acuta, glabra, distincte unguiculata, 1-nervosa; petala interiora 1·2 cm. longa, oblongo-lanceolata, acuta, unguiculata, marginibus pubescentia. *Stamina* 3 mm. longa, connectivis apiculatis terminata. *Ovaria* c. 3 mm. longa, tomentosa, *Carpella* (vix matura) rosea, oblonga, leviter apiculata, 1·3–1·5 cm. longa; stipites 8 mm.–1 cm. longi. *Semen* 1.

PENANG: Jungle behind No. 2 Plant House, Waterfall Gardens, *Sinclair S.F.N. 39356* (S., E., Kew) holotype.

KELANTAN: Kampong Kota, *Gimlette, 7th May, 1913* (S.).

TRENGGANU: Kampong Ladang, Kuala Trengganu, *Holttum S.F.N. 17675* (S.).

DISTRIBUTION: Borneo probably.

This seems to be the same as Airy-Shaw's *G.* sp. aff. *G. malayanus* Hk. f. et Th. et aff. *G. tapis* Miq.; [Kew Bull. (1939) 285] collected at Dulit by Richards, *Richards 2305*. Airy-Shaw states

that this specimen might well be placed in either species but this is not the case since it has apiculate stamens which *G. malayanus* never has.

G. umbrosus comes nearest *G. tapis* which also has apiculate stamens but differs from *tapis* having stalked and not sessile carpels. The leaves are more lanceolate, less coriaceous and more acute at the base. In *tapis* they tend to have a rounded base but less frequently the base can be acute. The species (holotype) is common in the forest surrounding the Waterfall Gardens at Penang. True *tapis* is also found in Penang.

(20) **G. tavoyensis** Chatterjee in Journ. Ind. Bot. Soc. 19 (1940) 77 Text-fig. 2.

Small tree 4 m. or more high. *Young branches* dark brown, glabrous, striate. *Leaves* thinly coriaceous, elliptic or narrowly elliptic, apex bluntly acuminate, base acute, glabrous, margin slightly revolute; main nerves 10–12 pairs, faint above, slightly more prominent beneath, oblique but not very straight, interarching 5–7 mm. from margin; reticulations very faint and lax or not visible; length 10–24 cm.; breadth 3·5–6·5 cm.; petiole 5 mm.–1 cm. long. *Flowers* solitary, axillary. *Pedicels* 5 mm. long with a few minute, lanceolate, acute bracts at base. *Sepals* deltoid-ovate, acute, glabrous, persistent, 4 mm. long. *Petals* coriaceous, outer ovate-lanceolate, acuminate, rusty, 8 mm. long and 4 mm. broad at base; inner shorter. *Stamens* numerous, 1·5 mm. long with apiculate connectives. *Ovaries* 7–8, narrowly cylindrical, glabrous; style filiform; stigma funnel-shaped. *Ripe carpels* 4–8, ellipsoid, apiculate, glabrous 1·4–1·8 cm. long and 8 mm.–1 cm. broad; stalks 2–3 mm. long. *Seed* solitary, white or light yellow, shining, slightly compressed.

LOWER SIAM: Khaw Pok Hill, *Haniff* and *Nur S.F.N. 3928* (S., K.); Kopah Bau, Krah, *Haniff* and *Nur S.F.N. 2746* (S., K.).
DISTRIBUTION: Burma, type, *Russel 2025* (C.).

Resembles *G. tapis* but differs in having smaller, less coriaceous leaves, drying greenish beneath and not brown.

(21) **G. macrophyllus** (Bl.) Hk. f. et Th. Fl. Ind. 1 (1855) 109 *in nota* et in Fl. Br. Ind. 1 (1872) 74; Miq. Fl. Ind. Bat. 1 pt. 1 (1858) 28 et Ann. Mus. Bot. Lugd.-Bat. 2 (1865) 35; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 325 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 97 Pl. 132; Ridley in Sarawak Mus. Journ. 1/3 (1913) 4 et F.M.P. 1 (1922) 66.

Basonym: Unona macrophylla Blume, Bijdr. (1825) 17.

Synonym: Polyalthia macrophylla Bl. Fl. Jav. Anon. (1830) 79 T. 39.

Shrub 3–5 m. high. *Young twigs* glabrous, angled, pale or dark coloured, older with well-marked striations. *Leaves* coriaceous, oblong-lanceolate to oblong-oblanceolate, acute, slightly narrowed to the sub-acute or rounded base, glabrous, texture dull, parchment-like (composed of minute elevations and depressions when viewed under a lens); main nerves 16–20 pairs, opposite or alternate, oblique, interarching near edge, faint and impressed above, more prominent beneath, midrib sunk above, smooth terete, and very prominent beneath; reticulations very faint or not visible; length 22–30 cm., sometimes over 50 cm.; breadth 6–11 cm.; petiole 1–3 cm. long, stout. *Flowers* solitary, axillary, or on the older branches. *Pedicels* 1–1·2 cm. long with 2–3 minute bracts at base. *Sepals* oblong-ovate or oblong-lanceolate, glabrous, acute, purplish, united at base, 1·5 cm. long. *Petals* greenish, coriaceous; outer 3·3 cm. long, oblong-lanceolate, acute, almost glabrous, concave inside; inner 1·8 cm. long, clawed, the blades rhomboid, acute, cohering by their edges. *Stamens* 3 mm. long with short filaments, anthers linear with large pollen grains and apiculate connectives. *Ovaries* 6 mm. long, glabrous, narrow, elongate, passing into the long, slender, slightly pubescent style; stigma U-shaped, split down the inner side. *Ripe carpels* red, glabrous, globose-ovoid, thin-walled, slightly apiculate, sessile, 1–2 cm. long and 1 cm. broad. *Seed* single, pale brown.

Numerous records from all the states in Malaya except Perlis and Province Wellesley.

DISTRIBUTION: Siam, Borneo, Java and Sumatra.

A common shrub best recognized by the parchment-like texture of its leaves.

35. OXYMITRA Hk. f. et Th. Fl. Ind. 1 (1855) 145. *Polyalthia* section *Oxymitra* Bl. Fl. Jav. Anon. 1 (1830) 71 T. 35, 36D, 37.

Woody climbers. *Leaves* with oblique, rather straight veins which do not anastomose at the edge in distinct loops but form broken or indistinct ones; reticulations scalariform. *Flowers* extra-axillary. *Sepals* 3, valvate. *Petals* 6, valvate; the outer large, long, flat or triquetrous and narrow, more or less spreading in mature flower; the inner much smaller, ovate-lanceolate, oblong or narrow, conniving over the stamens and ovaries, their edges adhering, the base not clawed or occasionally forming a rudimentary claw. *Stamens* numerous, with oblique, flat-topped or slightly convex

connectives. *Ovaries* oblong or cylindric, pubescent; style short, stigma sub-capitate or compressed-capitate, slightly falcate, usually pubescent and split on the top and on the inner side. *Ripe carpels* ovoid or oblong, thin-walled, usually stalked. *Seeds* 1, pale brown, rarely 2, sub-basal.

TYPE OF GENUS: *O. cuneiformis* (Bl.) Hk. f. et Th. Fl. Ind. 1 (1885) 145.

DISTRIBUTION: Assam, Burma, Malaya, Siam, Indo-China, Malay Islands, Philippines, Trop. West Africa. Species over 60.

The nearest related genus to *Oxymitra* is *Goniothalamus*. The outer petals of the two genera are similar especially in those species which have flat petals. The sepals too are often membranous and recall to a less extent those of *Goniothalamus*. The inner petals connive and arch over the sexual organs in the same way as in *Goniothalamus* and are united by their edges. There are three spaces at the base of the petals where the stamens can be seen. The inner petals are not however distinctly clawed as in *Goniothalamus;* there may be a rudimentary claw. The leaves with rather straight veins and scalariform reticulations recall some species of *Goniothalamus*. Other significant differences are:—the flowers are extra-axillary, not axillary as in *Goniothalamus* and all the species are climbers.

The climbing habit and extra-axillary flowers have some significance as these characters show a link with *Fissistigma*. Certain *Oxymitra* species with terete or nearly terete flower buds such as *O. latifolia, O. calycina* and *O. excisa* resemble certain *Fissistigma* species, especially *F. rubiginosum*. The leaves of these three mentioned *Oxymitra* species with their scalariform reticulations certainly recall those of *Fissistigma*. *Oxymitra* may therefore be one connecting link between the *Mitrephoreae* through relation to *Goniothalamus* and the *Xylopieae* through *Fissistigma*.

The genus in Malaya is not an easy one on account of certain species closely resembling each other or having intermediate forms. For example as is pointed out in the notes under individual species it is not easy to separate *O. Kingii, fornicata* and *desmoides*. More information is required about their distribution and fruiting. It is essential to collect flowers and fruit from the same plants. Then again *O. Biswasiana* Chatterjee is not distinct from *O. discolor* Craib and I have made it a synonym. The remaining Malayan species should not be so difficult to distinguish if flowers and fruit are available.

The name *Oxymitra* Hk. f. et Th. Fl. Ind. (1855) will probably be retained for this genus but it is antedated by the *Ricciaceous* genus *Oxymitra* Bischoff ex Lindeb. Syn. Hepat. Eur. (1829)

124. See van Steenis in Bull. Bot. Jard. Buitenzorg, Serie 3, Vol. 17, Part 4 (May 1949) 458. The proposed name *Friesodielsia* has not so far been accepted.

KEY

a. Sepals large, conspicuous, 7 mm.–1·3 cm. broad, ovate to orbicular, several-veined

b. Texture of sepals coriaceous, tomentose, veins very distinct and raised

c. Leaves up to 6 cm. broad, rarely obovate, the apex acute or acuminate, glaucous, pubescent to nearly glabrous below (1) **O. affinis**

c. Leaves 6–14 cm. broad, often obovate, the apex blunt, rounded, truncate or retuse, pubescent or tomentose below

d. Undersurface of leaf glaucous, rusty-pubescent, reticulations prominent but rather lax (2) **O. calycina**

d. Undersurface of leaf densely rusty-tomentose, entirely and densely covered with prominent reticulations (3) **O. excisa**

b. Texture of sepals membranous, slightly pubescent, veins not raised (4) **O. Kingii**

a. Sepals smaller, up to 6 mm. broad, average 2–3 mm., not orbicular, veins usually 1, if more never prominent or raised

e. Pedicels longer than the flowers

f. Pedicels 8–10 cm. long; flowers about 8 cm. long; base of leaf rounded and emarginate (5) **O. filipes**

f. Pedicels 2·8 cm. long; flowers 1·5 cm. long; base of leaf rounded but not emarginate (6) **O. alpina**

e. Pedicels shorter than flowers (sometimes equal to them, *O. glauca*)

g. Leaves 6–14 cm. broad, apex very blunt and rounded, sometimes emarginate; flower buds terete (7) **O. latifolia**

g. Leaves usually up to 6 cm. wide, the apex acute or acuminate; flower buds triangular or otherwise, not terete in cross-section.

h. Petals thin, flat, 6–7 mm. broad

i. Leaves glabrous on both surfaces; flower subsessile (8) **O. discolor**

i. Leaves rusty-tomentose on midrib above, rusty-pubescent beneath; flowers with rusty-tomentose pedicles 5 mm.–1 cm. long
(9) **O. borneensis** var. **sumatrana**

h. Petals thickened, coriaceous, triangular or thickened in cross-section not flat, 4 mm. broad

j. Leaves when fresh golden, shining beneath, carpels oblong (10) **O. biglandulosa**

j. Leaves when fresh glaucous beneath, less coriaceous

k. Carpels glabrous, black when dry, globose, stalks 8 mm.–1 cm. long; petals 2 mm. broad
(11) **O. glauca**

k. Carpels rusty-pubescent when dry, ellipsoid, stalks 1·5–1·8 cm. long; petals 4–5 mm. broad
(12) **O. argentea**

(1) **O. affinis** Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 70; Craib, Fl. Siam. Enum. 1 (1925) 48.

Climber. *Young twigs* densely rusty-tomentose, later black, striate, slowly becoming glabrous. *Leaves* thinly coriaceous, oblong

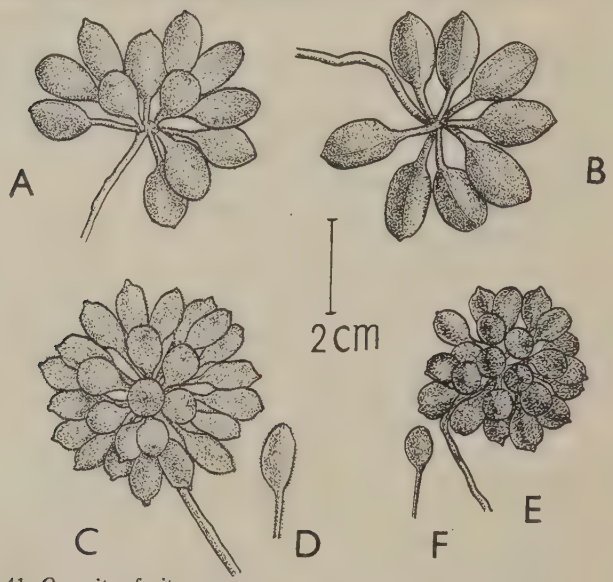


Fig. 41. *Oxymitra* fruits.
A, *O. biglandulosa*. B, *O. Kingii*. C, *O. affinis*. D, the same, a single carpel. E, *O. glauca*. F, the same, a single carpel.

or obovate-oblong, obtuse or sub-acute, slightly cordate, upper surface puberulous, lower glaucous and rusty-pubescent; nerves 9–12 pairs, oblique, visible above, prominent beneath as are the scalariform reticulations; length 10–15 cm.; breadth 4–5·5 cm.; petiole 5 mm. long, rusty-pubescent. *Flowers* extra-axillary, nodding, solitary, 2·5 cm. long. *Pedicels* 7 mm. long with a median, orbicular, 3 mm. long bract. *Sepals* 8–9 mm. long and about 1 cm. broad, orbicular-ovate, acute, several-veined, rusty-tomentose. *Outer petals* 2–5 cm. long, coriaceous, ovate-lanceolate, triquetrous when young in bud (it appears that they will become flat when mature) with a distinct central vein, acute, excavated at the base, pubescent outside, glabrous inside; inner rather shorter, acute with a very short claw. *Ovaries* 1-ovuled. *Ripe carpels* numerous, 1–1·2 cm. long, oblong-ovoid, apiculate, rusty-pubescent; stalks 8 mm. long, rusty-pubescent.

PENANG: *3160* no data (S.).

PERAK: Simpang, *Wray 3044* (S., C.) and *Wray 3013* (S.); Larut, *King 6558* ? (E.).

MALACCA: *Maingay 59* (C., Kew) type; Selandor, *Cantley 531* (S.).

JOHORE: Sungei Kayu, Mawai-Jemaluang Road, *Corner S.F.N. 32494* (S.).

DISTRIBUTION: Sarawak, *Beccari 5371* and *232* (Kew).

Some of the above quoted numbers may possibly not all be true *affinis* but they certainly closely resemble *Maingay 59* which is a very distinct plant. Craib points out in Fl. Siam. Enum. Page 48 that *Maingay 59,* the type of *O. affinis,* belongs to the concave petal group while plants referred to *affinis* by King and Ridley have flat petals and not concave ones. *O. affinis* sensu Ridley and King I have here called *O. Kingii.* It is quite a different plant having different sepals and different fruit but Craib's remarks about the petals being concave may not be altogether correct. The flowers on the type material are rather young and are certainly triquetrous in the bud. It looks as if they would flatten out later as is the case with the near related *O. borneensis* var. *sumatrana.* It however differs from *O. affinis* in the narrow, acuminate sepals and the narrower leaves.

(2) **O. calycina** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 348 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 125 Pl. 168; Ridley, F.M.P. 1 (1922) 81.

Climber 10–13 m. high. *Young twigs* rusty-tomentose with short, harsh hairs, later black, glabrous and striate. *Leaves* coriaceous, cuneiform-oblong, apex very broad and blunt, often emarginate, base narrowed, rounded and cordate, glossy green above,

black when dry, glabrous but the midrib rusty-pubescent, lower surface glaucous and rusty-pubescent on the midrib and nerves: nerves 8–14 pairs, impressed above, prominent beneath, curving slightly, interarching at the very margin in a broken and indistinct line; reticulations scalariform, faint above, prominent below; length 25–30 cm.; breadth 12–14 cm. at middle; petiole 5–7 mm. long, rusty-tomentose. *Flowers* solitary, extra-axillary. *Pedicels* 1·5–2·5 cm. long, rusty-tomentose with a pubescent, acute bract about 6 mm. long above the base. *Sepals* free, 1·5 cm. long, 1–1·3 cm. broad, elliptic, sub-acute, several-veined, rusty-tomentose on both surfaces. *Petals* coriaceous, yellow, lanceolate, 1-veined, caudate-acuminate, pubescent outside, both sets glabrous inside; outer 2–3 cm. long; inner cohering by edges except at very base, 1·4 cm. long. *Stamens* 1·5–2 mm. long with flat-topped, oblique connectives. *Ovaries* 2 mm. long, densely rusty-pubescent, cylindrical: style very short; stigma capitate-falcate, oblique, slightly grooved. *Ripe carpels* elliptic, apiculate, slightly pubescent, 7 mm.–1·3 cm. long; stalks 5 mm. long, pubescent. *Seed* 1.

PENANG: Government Hill, *Curtis 767* (S., Kew) type material.

PERAK: *Scortechini 853* (C.); Ulu Bubong, *King 10604* (S., C., D.D., Kew) type material; Larut, *King 4272* (C.); *7522* (C.); *8193* (C., Kew); *6780* (S., C., Kew); Relau Tujor, *Wray 1806* (S., C., E.); *2597* (S., C.); Sungei Siput, *Haniff* and *Nur S.F.N. 6971* (S., K.).

SINGAPORE: *Cantley*, no data, (S.). [Not seen recently in Singapore].

DISTRIBUTION: Confined to Malaya.

(3) **O. excisa** Miq. in Ann. Mus. Bot. Lugd.-Bat. 2 (1865) 32; Ridley in Sarawak Mus. Journ. 1/3 (1913) 89.

Climber. *Young twigs* rusty-tomentose. *Leaves* coriaceous, broadly oblong-obovate, apex retuse, base rounded and slightly cordate, upper surface slightly pubescent, tomentose on the midrib, lower surface rusty-tomentose, sub-glaucous; nerves 10–12 pairs, oblique and curving slightly, sunk above, prominent beneath, running out to margin; reticulations scalariform, very numerous and close together, prominent; length 15–20 cm.; breadth 9–13 cm.; petiole tomentose, 1–1·2 cm. long. *Flowers* solitary, extra-axillary. *Pedicels* tomentose, 5 mm. long with an ovate bract at base of calyx. *Sepals* ovate, obtuse, about 8-veined, tomentose except at base inside, 1 cm. long and 7 mm. wide. *Petals* coriaceous, yellow; outer lanceolate, triquetrous at the apex, acute, rufous-tomentose outside, pubescent inside except at the base, about 1·8 cm. long; inner puberulous outside, glabrous inside, 9 mm. long. *Stamens* many, connectives sub-rhomboid, truncate.

Ovaries tomentose; style very short, stigma sub-capitate, compressed, pubescent. *Ripe carpels* ellipsoid, slightly tomentose, apiculate, 1·4 cm. long and 8 mm. in diam.; stalks 1 cm. long, tomentose. *Seed* 1.

SINGAPORE: Sungei Sembawang, *Ridley 6428* (S., C.).
DISTRIBUTION: Sumatra, Bangka, Sarawak.

A rare species. There are no recent collections and this species is probably now extinct in Singapore. It is not mentioned in Ridley's Flora. The shape of the petals in bud and the leaves and habit recall *Fissistigma.* It is distinguished from *O. latifolia* and *calycina* by the leaves being densely tomentose beneath and the scalariform reticulations more numerous.

(4) **O. Kingii** J. Sinclair **sp. nov.**

O. affinis sensu King, Mat. F.M.P. Vol. 1 No. 4 (1892) 347 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 124 Pl. 166A; Ridley, F.M.P. 1 (1922) 79 (non *O. affinis* Hk. f. et Th.).

O. fornicatae Hk. f. et Th. proxima sed sepalis persistentibus, stipitibus carpellorum longioribus haec species differt.

Frutex scandens. *Ramuli* primum pubescentes dein glabri, nigri, striati. *Folia* tenuiter coriacea, oblonga, 12–19 cm. longa, 4–8 cm. lata, apice rotundata breviter acuta, basi rotundata, supra glabra, subtus ferrugineo-adpresso-pubescentia vel glabra; nervi 12–16 pares, obliqui, supra tenues, subtus prominentes; reticulationes scalariformes; petioli 7 mm. longi, pubescentes. *Flores* solitarii, extra-axillares. *Pedicelli* 7 mm. longi, ferrugineo-pubescentes. *Sepala* membranacea, late ovata, utrinque pubescentia, sub-acuta, in fructu persistentia, 8 mm.–1 cm. longa; 8 mm.–1 cm. lata. *Petala* pallido-flava, pubescentia; exteriora plana oblongo-lanceolata, sub-acuta, 4 cm. longa, nervo mediano et pluribus lateralibus nervibus praedita, interiora ovata, brevissime unguiculata, 8 mm. longa. *Stamina* 2 mm. longa, connectivis planis vel convexis. *Ovaria* 2 mm. longa, cylindrica, pubescentia; stylus brevis; stigma sub-capitatum falcatum, latere adaxiali fissum. *Carpella matura* cylindrica, utrinque rotundatis, ferrugineo-pubescentia 1·5–2 cm. longa; stipitis 6 mm.–1 cm. longi. *Semen* pallido-brunneum.

PERAK: Larut, *King 5126* (S., C., D.D., Kew) holotype; *King Nos. 1915* (C., Kew); *2806;* (C.); *7472* (C., Kew); *4010* (C.); Gopeng, *King 4618* (C.); Kampong Kota, *Wray 3339* (S., C., E.); Upper Perak, *Wray 3386* (C., S.); Tupai, *Wray 3083* (S., C.); foot of Maxwell's Hill, *Sinclair S.F.N. 38819* (S., E.).

PAHANG: Sungei Tahan, *Ridley August 1891* (S.).

JOHORE: Pulau Aor, *Henderson S.F.N. Nos. 18235* (S.) and *18243* (S.).

DISTRIBUTION: Probably Burma and Siam.

King and Ridley confused this species with true *O. affinis*. See notes under that species. *O. Kingii* is extremely like *O. fornicata* and may be the same. I have had little material of the authentic *fornicata* with which to compare it but it appears to have sessile carpels while they are stalked in *O. Kingii*. *O. desmoides* of Craib too, is very near this species. Craib unfortunately did not describe the fruit.

Sinclair S.F.N. 38851 cultivated in the garden of Mr. Tan Hoon Siang, 4 Leonie Hill Road, Singapore collected 15th November, 1949 is probably *O. desmoides*. The shrub has recently been cut down and destroyed. The flowers are on very short pedicels and resemble closely those of *King 5726,* the holotype of *O. Kingii*. No fruits have as yet been collected from this cultivated species. Mr. Tan does not know the origin of it but he admitted it was not a local species and had been planted in his garden. There is another sheet of *O. desmoides, Ridley 14725* in the Singapore Herbarium. On the label is stated:—'Origin Siam. Cultivated in Singapore by Saheb'.

(5) **O. filipes** Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 71; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 348 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 125 Pl. 167; Ridley, F.M.P. 1 (1922) 80 Fig. 8.

Climber. *Young twigs* pubescent, later glabrous, dark coloured, striate, lenticellate. *Leaves* membranous, oblong-lanceolate to oblong-obovate, apex acute, base rounded and emarginate or subcordate, glabrous above except the midrib and nerves, pubescent and glaucous below, tending to become glabrous with age; nerves 12–16 pairs, oblique, curving, faint above, prominent beneath, running out to margin with a broken or indistinct line of anastomosing; reticulations faint above, distinct below, scalariform but not very straight; length 12–22 cm.; breadth 4·5–7·5 cm.; petiole 3–7 mm. long, pubescent. *Flowers* faintly scented, extra-axillary on long slender pedicels 8–10 cm. long with a lanceolate bract 4–8 mm. long near middle. *Sepals* 7–9 mm. long, 4 mm. broad, ovate, acute, pubescent on both surfaces. *Petals* yellow, outer very long and slender, about 8 cm. long and 2 mm. broad, triquetrous, pubescent outside, glabrous inside, expanded and concave at base inside; inner glabrous, 1 cm. long, lanceolate with a caudate-acuminate apex. *Stamens* about 1·5 mm. long with flat-topped, oblique connectives. *Ovaries* 2 mm. long, cylindrical, rusty-pubescent; style very short, stigma faintly grooved; obliquely

capitate. *Ripe carpels* slightly oblong-ovate, apiculate, softly pubescent, thin-walled, 1·2 cm. long and 7 mm. in diam.; stalks 8 mm. long, pubescent. *Seed* 1, pale.

KELANTAN: Sungei Keteh, *Nur* and *Foxworthy S.F.N. 11973* (S.).

PERAK: *King 10982* (C., E.); *10778* (C., Kew); Gopeng, *King 513* (C., Kew); *820* (C.); *1112* (C., Kew); Ulu Bubong, *King 10014* (C., D.D., Kew).

PAHANG: Ulu Chineras, Kuala Lipis, *Burkill* and *Haniff S.F.N. 17085* (S., K., Kew).

SELANGOR: Ulu Gombak, *Hashim 120* (K.).

MALACCA: *Maingay 60* (C., Kew) type.

JOHORE: Sungei Kayu, *Kiah S.F.N. 31962* (S.); *Corner, 27th October, 1936* (S.); S. Sedili, *Corner, 13th April, 1935* (S.); Sungei Segun, Gunong Panti, *Corner S.F.N. 30692* (S.); 13½ mile Mawai-Jemaluang Road, *Corner S.F.N. 29435* (S., C., K., Kew).

DISTRIBUTION: Not known outside Malaya.

Easily distinguished by the long slender pedicels and filiform petals.

(6) **O. alpina** J. Sinclair, **sp. nov.**

Haec species montana ad sectionem cum petalis concavis pertinet. Flores eis in *O. latifolia* minores sed pedicellis longioribus suffulti. Folia *O. affinis* forma aliquanto similia sed glabra.

Fig. 42. *Oxymitra alpina* J. Sinclair.
A, Flowering twig. B, Fruiting twig.

Frutex scandens. *Ramuli* glabri, nigri, striati. *Folia* tenuiter coriacea, lanceolata, 8·5–13 cm. longa, 3–4 cm. lata, costis superioribus puberulis exceptis glabra; nervi 12–14 pares, obliqui, erectiusculi, tenues, subtus prominentes; reticulationes scalariformes, tenues, interdum indistinctae; petioli 6–8 mm. longi. *Flores* extra-axillares vel terminales, in alabastro teretes. *Pedicelli* 2·8 cm. longi, glabri; bractea media linearis acuta 4 mm. longa. *Sepala* 4 mm. longa et 4 mm. lata, acuta, extus pubescentia, intus glabra. *Petala* coriacea lanceolata, acuta, extus minute pubescentia, intus concava, glabra; exteriora 1·5 cm. longa; interiora 7 mm. longa. *Stamina* 1 mm. longa, connectivis obliquis convexis. *Ovaria* ferrugineo-tomentosa 2·5 mm. longa; stylus brevis; stigma capitato-compressum, pubescens. *Carpella matura* 1·3–1·5 cm. longa, cylindrico-oblonga, glabra, apice acuta, basi sensim in stipitem brevem, 4 mm. longum angustata. *Semen* 1 pallido-brunneum. **Fig. 42.**

PERAK: The Box, Maxwell's Hill, *Yeob, Forest Dept. F.M.S. 1451* (S.) type. One sheet only. Altitude 4,076 feet.

A mountain species, apparently rare. Only one sheet in Herb. Sing.

(7) **O. latifolia** Hk. f. et Th. Fl. Ind. 1 (1855) 145 et in Fl. Br. Ind. 1 (1872) 70; King in Ann. Roy. Bot. Gard. Calc. 4 (1893) 126 Pl. 166B; Ridley, F.M.P. 1 (1922) 81; Craib, Fl. Siam. Enum. 1 (1925) 49.

Climber 6–20 m. long. *Young branches* rusty-tomentose, later glabrous, dark-coloured and striate. *Leaves* usually large, varying in size, thickly membranous, oblong-ovate, slightly obovate, obtuse, truncate or less often retuse or bluntly acute, base rounded and slightly cordate, dark green above, rather dull, glabrous except the rusty-pubescent midrib, lower surface greenish white or subglaucous, softly rusty-pubescent; nerves 10–16 pairs, oblique, rather straight, prominent beneath, interarching at the very edge; reticulations scalariform, prominent and numerous beneath; length 17–28 cm.; breadth 6–12 cm.; petiole 1·2–1·5 cm. long, rusty-tomentose. *Flowers* solitary, extra-axillary. *Pedicels* 5 mm.–1 cm. long, rusty-tomentose with an ovate or oblong bract 5 mm. long near the base or sub-median. *Sepals* coriaceous, sub-orbicular or broadly triangular, obtuse, rusty-pubescent outside, glabrous inside, 4 mm. long and 4–6 mm. wide. *Petals* creamy white turning brown when old, coriaceous, outer ovate-lanceolate, tips triquetrous, bluntly acute, very slightly tomentose outside, glabrous inside, 2·5–4 cm. long; inner 1·8–2·7 cm. long, broadly ovate, acuminate, adhering at the tips. *Stamens* 1·5 mm. long, white, connectives convex. *Ovaries* 2·5 mm. long, oblong, pubescent; style

very short, stigma falcate-capitate, pubescent, split down the inner side. *Carpels* oblong-ovoid, apiculate, slightly pubescent, brownish and slightly granular when dry, 1·5 cm. long and 7 mm. in diam.; stalks 1·5–2 cm. long. *Seed* solitary, pale, shining.

PENANG: 2 sheets as type in Herb Kew, stamped Herbarium Hookerianum (1) Dom. Phillips, date 1824 and (2) bears the writing *"Uvaria grandifolia 3136"*, no collector's name or date (S.).

PERAK: *King 8681* (C.); *8841* (C.); Larut, *King 5562* (C., D.D., Kew); *4016* (C., D.D., Kew); *4974* (S., C.); *6879* (S., C.); *6026* (S., C., E.); Tapa, *Wray 1379* (S., C.); *188* (S., C.); Relau Tujor, *Wray 1833* (S., C., Kew); Ulu Bubong, *King 10258* (Kew).

TRENGGANU: Ulu Bendong, Kajang, Kemaman, *Corner S.F.N. 30159* (S., Kew).

PAHANG: Gali near Raub, *Burkill* and *Haniff S.F.N. 16224* (S.).

SELANGOR: *Ridley, August 1904* (S.); Klang Gates, *Sinclair, 12th November, 1953* (S.).

NEGRI SEMBILAN: Sungei Menyala F.R., Port Dickson, *Sinclair S.F.N. 40146* (S.).

MALACCA: *Maingay 57* (C., Kew); Selandor Forest near Tebong, *Burkill S.F.N. 1339* (S.); Bukit Bruang, *Curtis, May 1901* (S.).

JOHORE: Muar, *Curtis, April 1901* (S.); 13¼ mile, Mawai-Jemaluang Road, *Corner S.F.N. 29434* (S., Kew); Sungei Kayu, *Corner, 14th April, 1935* (S.).

SINGAPORE: Chan Chu Kang, *Goodenough, date 1893* (S.); Garden Jungle, *Ridley 10809* (Kew).

DISTRIBUTION: Malaya.

This species is not uncommon in Singapore in the MacRitchie Reservoir forest and the Botanic Gardens' jungle but it seldom flowers. It recalls *O. calycina* but that species has cuneiform, oblong leaves which are usually much more emarginate or retuse at the apex. The spaces between the veins are wider, there being fewer veins. The leaves of *O. latifolia* dry brownish-green above and not black. Also they are less glaucous beneath. The sepals of *O. calycina* are much larger and are several-veined while the petals have a prominent mid-vein which appears to be lacking in *O. latifolia*. The carpels of *O. calycina* are ovoid and shorter.

The shape of the petals and the venation of the leaves superficially recall *Fissistigma rubiginosum*.

(8) **O. discolor** Craib in Kew Bull. (1925) 11 et Fl. Siam. Enum. 1 (1925) 49.

Synonym: O. Biswasiana Chatterjee in Journ. Ind. Bot. Soc. 19 (1940) 2.

Woody climber. *Stem* and *branches* terete, black, lenticellate. *Leaves* lanceolate or elliptic-lanceolate, acute, base acute, rarely rounded, glabrous on both surfaces, glaucous beneath; nerves 8–13

pairs, ascending, conspicuous below as are the scalariform reticulations; length 7·5–16 cm.; breadth 2·5–6 cm.; petiole 4–6 mm. long. *Flowers* solitary, extra-axillary, subsessile, pyramidal. *Bract* solitary, ovate-lanceolate, situated at the base of calyx. *Sepals* broadly deltoid, granular, faintly several-veined, glabrous inside, minutely pubescent outside, 4–7 mm. long and 4·5 mm. broad. *Petals* ovate-lanceolate, entire, acute, minutely pubescent on both sides, outer somewhat flat, 1·2–3·5 cm. long, 6 mm. broad; inner slightly shorter, 9 mm. long. *Stamens* numerous, linear, cuneate with large, convex connectives. *Torus* convex. *Ovaries* 8–10, narrowly elliptic, densely pubescent, 1·5 mm. long; stigma compressed, pubescent. *Ripe carpels* 5–6, ovoid, rusty, 11–12 mm. long and 8–9 mm. broad; stalks 4 mm. long. *Seed* solitary, ovoid, reddish-brown, shining with a median, longitudinal depression.

KEDAH: Pulau Adang, *Ridley 15904* (S., Kew); Langkawi, *Holttum S.F.N. 15143* (S., Kew).

MALACCA: *Maingay 3397* (Kew distribution No. 61) (Kew) named *O. Biswasiana*.

DISTRIBUTION: Burma, Heinze Chaung Camp. 550 m., *P.T. Russell 2095* type and co-type of *O. Biswasiana* (C.) and *1814* (C.) 4 sheets seen by me; Siam, *Kerr 6910* (Kew) type of *O. discolor*.

This seems to be a rare species in Malaya. It is similar to *O. Kingii* but differs in having glabrous, very thin leaves, smaller flowers and smaller carpels. The Pulau Adang specimen, *Ridley 15904* is quoted as *O. fornicata* var. *glabra* in Ridley's Flora.

(9) **O. borneensis** Miq. var. **sumatrana** Miq. in Ann. Mus. Bot. Lugd.-Bat. 2 (1865) 31.

Climber. *Young twigs* densely ferrugineous-tomentose, later glabrous and black. *Leaves* also at first covered with a rusty pubescence, especially on the midrib and nerves, slowly glabrescent, glaucous beneath, narrow-oblong, apex bluntly obtuse or sometimes apiculate, base emarginate; nerves 13–15 pairs, visible above, prominent beneath; reticulations scarcely visible above, scalariform, prominent beneath, length 14–17 cm.; breadth 3–6 cm.; petiole 5 mm. long. *Pedicels* extra-axillary, 5 mm.–1 cm. long, rusty-tomentose with a median, linear, rusty-tomentose bract 2 mm. long. *Sepals* rusty-tomentose outside, glabrous inside, triangular at base, narrowed into an acuminate apex, 1-veined, 5 mm. long and 3 mm. broad at base. *Outer petals* thin, flat, ribbon-like, rusty-pubescent outside, puberulous inside, 1-veined, 5–6 cm. long, and 6–7 mm. broad. *Inner petals* glabrous, 1·3–1·5 cm. long, tapering from the base to a narrow needle-like apex. *Carpels*

(not mature) ellipsoid-globose, slightly pubescent, probably becoming glabrous, 8 mm. long with stalks 1 cm. long (probably larger when mature).

JOHORE: Batu Pahat, *Ridley, date 1900* (S.).
SINGAPORE: *King 1195* (Kew); Bukit Timah, *Ridley 6343* (S.); Chua Chu Kang, *Ridley, date 1894* (S.).
DISTRIBUTION: Type, *Korthals* (Kew) Sumatra.

Not previously recorded from Malaya. At first I thought that the above quoted specimens might be *O. affinis* but they differ from it and from *O. borneensis* in the narrow, acuminate sepals. The broadly ovate sepals of *O. affinis* resemble those of *O. calycina* and are several veined, in contrast to the one prominent vein in *O. borneensis* var. *sumatrana*.

This variety differs from *borneensis* proper in having narrower, less hairy leaves. The base is not quite so markedly emarginate and the undersurface is glaucous with shorter hairs becoming glabrous. The pedicels are shorter, the sepals narrowed towards the acuminate apex. The carpels are less pointed at the apex and are not hirsute.

(10) **O. biglandulosa** (Bl.) Scheff. in Nat. Tijdschr. Ned. Ind. 31 (1870) 341; King, F.M.P. Vol. 1 No. 4 (1892) 349 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 127 Pl. 170; Ridley in Sarawak Mus. Journ. 1/3 (1913) 88 et F.M.P. 1 (1922) 81.

Basonym: Guatteria biglandulosa Bl. Fl. Jav. Anon. (1830) 102 T. 51; Hk. f. et Th. Fl. Ind. (1855) 143.

Synonym: Polyalthia biglandulosa Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 65.

Climber 15–33 m. high. *Young twigs* slender, minutely sericeous, soon dark coloured and glabrous. *Leaves* coriaceous, elliptic or elliptic-oblong, acute or shortly acuminate, the edges slightly recurved when dry, base rounded or slightly cuneate, upper surface glabrous, lower glabrous or slightly puberulous and of a golden shining tint; main nerves 8–13 pairs, oblique, curving slightly, running out to the edge, faint and raised above, prominent beneath; reticulations fine, faint, scalariform. *Flowers* solitary, extra-axillary. *Pedicels* 1·2 cm. long, angled, slender, with a minute, subulate bract at middle. *Sepals* 5–6 mm. long, and 2–3 mm. br., coriaceous, ovate, acuminate, adpressed-rusty-pubescent on both surfaces. *Petals* yellow, coriaceous; outer lanceolate-oblong, obtuse, expanded and concave inside in the lower third,

rusty-adpressed-pubescent, (nearly glabrous inside), the midrib prominent, 2·5–3·2 cm. long and 6–7 mm. broad, inner acute with broad bases, 1-veined, 5 mm.–1 cm. long, pubescent outside, glabrous inside. *Stamens* 1–1·5 mm. long with flat-topped and slightly oblique connectives. *Ovaries* 2 mm. long, rusty-pubescent, oblong, slightly curved, style short and slender, stigma sub-capitate-falcate, grooved on the top and on the inner side. *Ripe carpels* oblong, blunt at each end or slightly or not apiculate at apex, puberulous or glabrous, 1·3–1·5 cm. long, 7–8 mm. in diam.; stalks 1–1·5 cm. long. *Seeds* 1, occasionally 2.

PERAK: Ulu Kerling, *King 8746* (S., C., Kew); Larut, *King 2873* (C., D.D.); Taiping, *King 8389* (E.); Kinta, *King 3009* (Kew); Gopeng, *King 5899* (Kew) and *King 6049* (S., E., Kew).

SELANGOR: Kuala Lumpur, *Curtis, no date or number* (S.).

MALACCA: *Griffith 456* (Kew); *Maingay 49* (Kew).

SINGAPORE: Sungei Jurong, *Ridley, date 1896* (S.); Seletar Forest behind vegetable gardens at Nee Soon, *Sinclair S.F.N. 38870* (S., E.).

DISTRIBUTION: Borneo and Sumatra.

The golden colour of the undersurface of the leaves is probably a good diagnostic character. It may not always be seen in dried specimens.

(11) **O. glauca** Hk. f. et Th. Fl. Ind. 1 (1855) 146 et in Fl. Br. Ind. 1 (1872) 71; Miq. Fl. Ind. Bat. 1 pt. 1 (1858) 50; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 350 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 128 Pl. 171A; Ridley in Sarawak Mus. Journ. 1/3 (1913) 88 et F.M.P. 1 (1922) 82.

Climber. *Young* branches slender, minutely tomentose, soon glabrous, striate and black. *Leaves* thinly coriaceous, varying a good deal in shape, elliptic to elliptic-lanceolate, obtuse, acute or acuminate, base rounded or acute, upper surface dark green, dull and glabrous, lower glabrous or often very slightly pubescent on midrib and nerves, glaucous (this character tending to disappear in old leaves); nerves 9–14 pairs, oblique, straight or curving slightly, faint above, prominent beneath, running out to the margin; reticulations faint, close together, scalariform; length 9–21 cm.; breadth 4–6 cm.; petiole 7–8 mm. long. *Flowers* solitary, extra-axillary on slender pedicels 1·8–2·8 cm. long with a median, minute, subulate bract. *Sepals* ovate, acuminate adpressed-pubescent, 4 cm. long and 2–3 mm. broad. *Outer petals* yellow, linear-lanceolate, sub-acute, minutely pubescent outside, glabrous inside, midrib prominent, 1·8–2·8 cm. long and 4 mm. broad; inner shorter, about 5 mm.–1 cm. long, yellow, glabrous, the base broad and the apex acuminate. *Stamens* as in *O. biglandulosa*. *Ovaries*

as in *O. biglandulosa* but slightly smaller. *Carpels* numerous, globose, slightly apiculate, glabrous to slightly pubescent, 1 cm. long and 7 mm. in diam.; stalks 8 mm.–1 cm. long. *Seed* 1, pale.

PENANG: "Prince of Wales Island" *Phillips,* Herb. Hooker, type material (Kew).

KEDAH: Kedah Peak, *Haniff* and *Nur S.F.N. 5166* (S.).

KELANTAN: Sungei Ketil, *Henderson S.F.N. 24815* (S., C., Kew) probably *O. glauca.*

PERAK: Gunong Batu Puteh, *Wray 482* (S.) leaves long in proportion to breadth; Relau Tujor, *Wray 2899* (S.) leaves long in proportion to breadth; Ulu Bubong, *King 10606* (C., D.D., E., Kew) and *10464* (C., D.D.); Gopeng, Kinta, *King 4401* (Kew); *King 4451* (C.); *King 4454* (Kew); Ulu Kerling, *King 8833* (C., D.D., Kew) and *10192* (C.); Larut, *King 4151* (C.).

PAHANG: Jerantut, *Burkill* and *Haniff S.F.N. 16095* (S., Kew) nearer to *biglandulosa* especially in the fruit. The leaves are smaller than normal. Merapoh, *Henderson S.F.N. 23201* (S.) somewhat intermediate between *glauca* and *biglandulosa.*

MALACCA: *Maingay 58* (C., Kew); Merlimau, *Alvins, 17th April, 1886* (S.); Selandor, *Alvins 446* (S.).

JOHORE: Sungei Tebrau, *Ridley, March 1908* (S.); Kuala Sembrong, *Lake* and *Kelsall 4048* (S., C.); S. Kayu, *Kiah S.F.N. 32044* (S.).

SINGAPORE: Jurong, *Corner S.F.N. 26151* (S., Kew) approaching *O. biglandulosa.*

DISTRIBUTION: Borneo and Sumatra.

This is a variable and difficult species. There may be more than one plant included in *glauca* or there may be hybrids between it and *biglandulosa. O. biglandulosa* and *O. argentea* are near to it. The leaves of *biglandulosa* are more coriaceous and of a golden shining brown below, not glaucous. The flowers too are slightly larger, the pedicels shorter, and the ripe carpels more elongated with longer stalks than in *glauca.* For other differences see under *O. argentea.*

(12) **O. argentea** J. Sinclair, **sp. nov.**

Haec species adhuc *O. glauca* et *O. biglandulosa* confusa est. Ab ea pedicellis floriferis crassioribus, carpellis ellipsoideis rufo-pubescentibus longioribus stipitatis, ab hac foliis glaucis carpellis non oblongis distinguitur.

Frutex scandens. *Ramuli novelli* minute fulvo-pubescentes, deinde nigricantes, glabri striati. *Folia* tenuiter coriacea, supra atro-viridia non nitida, secus costam pubescentia demum glabra, subtus valde glauca, oblongo-vel elliptico-lanceolata, apice acuminata, basi acuta; 12–17 cm. longa; 4–6 cm. lata; petioli 8 mm.–1 cm. longi minute pubescentes; nervi 11–13 pares obliqui, supra depressi, subtus valde elevati; reticulationes utrinque graciles, scalariformes. *Flores* foliis oppositi, in alabastro triquetri; pedicelli

crassi, minute pubescentes, 1 cm. longi (in fructu ad 2 cm. longi), medio vel infra bractea 2 mm. longa acuta praediti. *Sepala* triangularia, acuminata, 1-nervosa, 5 mm. longa, extus minute fulvo-pubescentia, intus glabra. *Petala exteriora* coriacea, 1-nervosa,

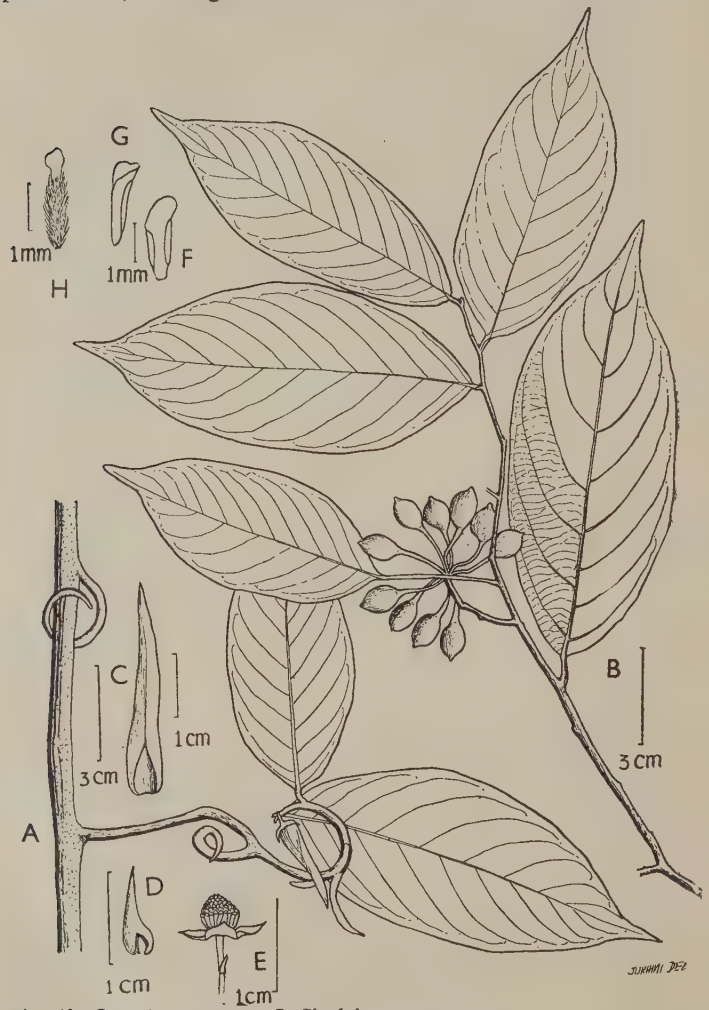


Fig. 43. *Oxymitra argentea* J. Sinclair.
A, Flowering twig. B, Fruiting twig. C, Outer petal. D, Inner petals. E, Flower with petals removed. F, Stamen, front view. G, Stamen, side view. H, Gynoecium.

extus fulvo-pubescentia, intus glabra, triquetra, saepe torta, 3·5 cm. longa, 4–5 mm. lata, basi concava, apicem versus sensim angustata; *interiora* 6 mm.–1 cm. longa, glabra vel puberula, apice aciculata. *Ovaria* elongata, dense hirsuta, 2 mm. longa. *Stylus* brevis. *Stigmata* clavato-infundibuliformia. *Carpella matura* ellipsoidea, apiculata, rufo-pubescentia, 1–1·2 cm. longa; stipites graciles 1·5–1·8 cm. longi, apice paullo crassiores. *Semen* 1. **Fig. 43.**

KELANTAN: Gua Panjang at Gua Ninik, *Henderson S.F.N. 19594* (S.).

PERAK: Waterfall Hill, *Wray 2082* (S.).

TRENGGANU: Bukit Kajang, Kemaman, *Corner S.F.N. 30457* (S., Kew) holotype; Sri Bangun near Bukit Besi, *Sinclair S.F.N. 39871* (S.).

DISTRIBUTION: Sarawak, Mount Dulit, *Richards 1217* (S., Kew) distributed as *O. biglandulosa.*

Named *O. argentea* from the glaucous, silvery undersurface of the leaves. It has been confused with *O. glauca* and *O. biglandulosa.* The carpels stalks are longer than those of *O. glauca* and about the same length as those of *O. biglandulosa.* The carpels of both dry black and are glabrous but in *argentea* they are pubescent and of a rusty colour. The shape of the carpels in *argentea* is ellipsoid; they are more globose in *glauca* and oblong in *biglandulosa.* The flower buds are thicker and stouter with stouter pedicels than those of *glauca.* The colour of the flower is brownish yellow while it is yellow in *glauca.* The golden colour of the lower surface of the leaves of *biglandulosa* should distinguish it.

36. MITREPHORA Hk. f. et Th. Fl. Ind. 1 (1855) 112. *Uvaria* section *Mitrephorae* Bl. Fl. Jav. Anon. (1830) 13.

Tree or shrubs. *Leaves* with nearly parallel nerves and fine reticulations. *Flowers* hermaphrodite, extra-axillary, opposite the leaves. *Sepals* valvate. *Petals* valvate, outer spreading, narrowed slightly to base; inner slightly shorter, mitriform, cohering by their edges above, free below with very narrow claws. *Stamens* numerous with flat-topped connectives. *Ovaries* numerous with subcapitate stigmas. *Torus* hairy, not very massive in fruit. *Ripe carpels* stalked or sessile; seeds about 4–8 in 2 rows.

SYNTYPES OF GENUS: *M. obtusa* (Bl.) Hk. f. et Th.; *M. humilis* (Bl.) Miq.; *M. polypyrena* (Bl.) Miq.

DISTRIBUTION: India, Ceylon, Burma, Siam, Indo-China, Borneo, Java and Philippines.

Quite a distinct genus from *Pseuduvaria* which Bentham, Hooker, King and Ridley included in *Mitrephora.* The texture of the leaves is quite different from *Pseuduvaria* and the flowers are

extra-axillary and not axillary as in *Pseuduvaria*. There is a close alliance however and a similarity in the flower parts and their arrangement but the flowers of *Pseuduvaria* are unisexual and the exterior petals are shorter than the interior. Two species are described here but there are two sheets *Kiah S.F.N. 35382* and *Best S.F.N. 21207* from Kedah in the Singapore herbarium which probably belong to a third undescribed species. These resemble *M. Maingayi* in the foliage. However the carpels are not ferrugineous but pale buff-tomentose and have more seeds. As these are in fruit only it is better not to give a name at this stage but to wait for flowering material. The Malayan material included by Hooker f. and Thomson under *M. obtusa* is not that species but *M. Maingayi*.

KEY

a. Leaves glabrous or slightly pubescent beneath, base acute to slightly rounded, nerves 6–12 pairs; pedicel bracts 1 mm. long (1) **M. Maingayi**

a. Leaves rusty pubescent beneath, base rounded to cordate, nerves 18–20 pairs; pedicel bracts 5–6 mm. long (2) **M. vulpina**

(1) **M. Maingayi** Hk. f. et Th. in Fl. Br. Ind. 1 (1872) 77; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 335 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 112 Pl. 154; Ridley, F.M.P. 1 (1922) 73.

Synonyms: M. obtusa Hk. f. et Th. Fl. Ind. 1 (1855) 113 excl. type. *M. Teysmannii* Scheff. in Flora 52 (1869) 302.

Tree 10–15 m. high with spreading branches. *Youngest twigs* rusty-pubescent, soon becoming black and glabrous. *Leaves* deep green, coriaceous, shining and glabrous on upper surface, the upper midrib occasionally rusty-pubescent, rusty-pubescent on the midrib and nerves below, soon glabrous, rather variable in shape, elliptic, oblong-elliptic to elliptic-ovate, acute or acuminate, base acute or slightly rounded and often a trifle unequal-sided; nerves 6–12 pairs, prominent on both surfaces, curving and ascending, anastomosing at margin in a very broken line; reticulations forming a fine network, visible on both surfaces; length 10–15 cm.; breadth 4–6 cm.; petiole 7–8 mm. long. *Peduncles* extra-axillary, opposite the leaves, 1·5–3 cm. long bearing up to 5 flowers (one opening at a time) alternately in two ranks, each flower in the axil of an acute bract, 1 mm. long. (Normally only one flower persists to set fruit, the rest drop off). *Pedicels* about 2 cm. long, rusty-tomentose with a medial clasping bract 1 mm. long. *Sepals* 2–3

mm. long, ovate-triangular, acute, free at the base, rusty-tomentose outside, glabrous inside. *Outer petals* pale yellow, mottled with red, 1·3–2 cm. long, orbicular or obovate, rounded at apex and suddenly shortly mucronate, narrowed to the base with a claw 3–5 mm. broad, rusty-tomentose outside, glabrous or slightly puberulous inside with erose margins, *inner* darker yellow, mottled with red, about 7 mm. long, pubescent on both surfaces, vaulted, blade cordate to rhomboid, the claw very narrow, 1 mm. or less in breadth. *Stamens* numerous, 1 mm. long with flat-topped connectives. *Torus* not massive, short hairs present among ovaries. *Ovaries* about 1 mm. long, angled, stigma sub-capitate, discoid. *Ripe carpels* broadly ovoid, blunt at each end, densely rusty-tomentose as are the stalks, the tomentum wearing off with age, length 2·5 cm.; diameter 1·8 cm.; stalks about 1·8 cm. long. *Seeds* 4–5 in 2 rows, compressed.

TYPE: Malacca, *Maingay 65* (C., Kew).

A common species well represented in herbaria from the following states:—Penang, Perak, Pahang, Selangor, Malacca but rarer in Negri Sembilan and Johore and not found in Singapore. The variety *Kurzii* King occurs in Burma and has the underside of the leaves more pubescent than in the type.

(2) **M. vulpina** C.E.C. Fischer in Kew Bull. (1926) 449.

Twigs at first densely rusty-pubescent soon becoming glabrous, lenticels few. *Leaves* thinly coriaceous, oblong or sub-elliptic, shortly acute, base rounded and slightly cordate, glabrous and shining on upper surface except the rufous-pubescent midrib, lower surface softly fulvous-pubescent with adpressed pubescence on midrib and veins and shortly ciliate on the margins; nerves 18–20 pairs, nearly parallel, oblique, some of them interarching about 1 mm. from margin, the line of interarching, faint, indistinct and broken; reticulations on upper surface very close and faint, on lower surface more open but faint; length 14–16 cm.; breadth 7·5–10·5 cm.; petiole 5 mm.–1 cm. long, rusty-tomentose. *Flowers* 2-ranked on a short, tomentose, multi-bracteate axis (*peduncle*) about 3–4 cm. long which arises opposite the leaves. *Pedicels* with tomentum like the peduncle, 1·2–1·5 cm. long with an amplexicaul, acute bract, 5–6 mm. long just below calyx; bract glabrous on the upper adaxial side. *Sepals* broadly ovate, acute, densely rusty-pubescent outside, glabrous inside, 5 mm. long. *Petals* yellow, *outer* acute, oblong-lanceolate with slightly undulate margins, tomentose outside, glabrous inside, 1·5 cm. long and 0·5 cm. broad; *inner* narrower, clawed, vaulted and cohering at top,

slightly pubescent outside and glabrous inside but not rusty-pubescent like the outer sepals and petals, slightly smaller than the outer petals. *Stamens* numerous, 1 mm. long or less with broad, flat, smooth tops. *Ovaries* few, elongate, pubescent, 1 mm. long. *Ripe carpels* globose or oblong, obtuse, thick-walled, slightly rugose, shortly and densely rusty-tomentose, 2–2·3 cm. long and 1·6–2 cm. in diameter, several-seeded; stalks stout, 3–4 cm. long, rusty-tomentose.

PERAK: Gunong Kerbau, *King 4788* (C.).
SELANGOR: 16th mile Ulu Gombak, *Strugnell 12466* (S., K., Kew).
DISTRIBUTION: Siam.

This species has not been previously recorded from Malaya. It is very close to *M. Collinsae* Craib [Kew Bull. (1922) 168] but I have not seen enough material of both to make a definite statement. The tomentum is reddish brown in *M. vulpina* but more yellowish in *Collinsae*.

Mitrephora crassipetala Ridley, Journ. Roy. As. Soc. Str. Br. 54 (1909) 13 et F.M.P. 1 (1922) 74 is *Anaxagorea javanica* Bl.

37. POPOWIA Endl. in Walp. Repert. 1 (1842) 74.

Shrubs or small trees. *Leaves* granular or subgranular in texture, glabrous, pubescent or tomentose. *Flowers* rather small, single or in fascicles, opposite the leaves. *Sepals* 3, valvate. *Petals* 6, valvate, thick; outer small, spreading, slightly larger than the sepals; inner larger than the outer, concave inside, somewhat connivent and erect, their edges at first adhering, later free, their apices often incurved, base shortly clawed, sometimes the outer and inner united at the base forming a sympetalous corolla. *Stamens* cuneate with broad, flat-topped or slightly concave connectives. *Ovaries* few, ovoid to oblong; style very short; stigma sub-capitate or wedge-shaped, grooved on the top and down the inner side. *Ripe carpels* globose or ovoid, sub-sessile or stalked. *Seeds* 1–4, rugose or pitted and with a circumferential ridge.

TYPE OF GENUS: *P. pisocarpa* (Bl.) Endl. in Walp. Repert. 1 (1842) 74.

DISTRIBUTION: Species about 90 but when properly examined many of these will probably be found to belong to other genera. Majority from Tropical Africa. The remainder, Madagascar, S. India, Burma, Siam, Malaya, Indo-China, Malay Islands to Australia.

This genus is probably nearest to *Pseuduvaria, Mitrephora* and *Neo-uvaria*. Its systematic position has been much disputed by the various authors. I venture to follow Hooker f. and Thomson, King and Scheffer and place it in the *Mitrephoreae*. The inner petals

are shortly clawed as in *Neo-uvaria* and are slightly connivent. They differ however in not having the long narrow claws of *Pseuduvaria* and *Mitrephora* but they certainly have the three basal arch-like spaces and do adhere by their edges for some time before they separate. All four genera have similar stamens with flat-topped connectives. Also the style is usually short and the stigma capitate or sub-capitate. *Neo-uvaria* and *Pseuduvaria* have axillary flowers while *Popowia* and *Mitrephora* have extra-axillary ones. There is a less degree of resemblance to *Orophea* in which the inner petals too are mitriform, cohering by their edges with long free claws but the stamens are very different (miliusoid). *Orophea* in this respect seems to be a connecting link between the *Mitrephoreae* and *Miliuseae*.

The genus *Popowia* in Malaya is not altogether an easy one. *P. pisocarpa* is a variable species and the more pubescent forms of it are liable to be confused with other species. *P. pauciflora* is very rare and the material I have seen of it is fragmentary, more material is required as the description is not quite complete. *P. velutina* is very close to *P. fusca* and may have to be included in it. *P. perakensis* should not give the systematist any trouble. *P. tomentosa* is nearest to *P. hirta* from Sumatra. I have made a new variety of *P. tomentosa,* namely var. *crinita* which may be specifically distinct.

A *Popowia* from Pulau Tioman, *Burkill S.F.N. 1148* and *Nur S.F.N. 18854* appears to be a new species but the material is inadequate to describe it as such. There are also in the Singapore Herbarium several unnamed sheets of *Popowia* species from Borneo. Some of these are probably new but again the material is inadequate.

KEY

a. Reticulations not visible in adult leaves; inner petals about 3 mm. long; seed 1 (1) **P. pisocarpa**

a. Reticulations visible in adult leaves except in *pauciflora*; inner petals over 3 mm. long; seeds 1 or more

b. Seeds 1; carpel stalks 2–8 mm. long

c. Inner petals 3 times as long as outer (2) **P. pauciflora**

c. Inner petals less than 3 times as long as outer

d. Leaves pubescent beneath with thickened pubescent edges; nerves 8–11 pairs (3) **P. fusca**

d. Leaves pubescent to tomentose beneath and less oval than *P. fusca*; nerves 6–7 pairs (4) **P. velutina**

b. Seeds more than 1; carpels stalks 8 mm.–1 cm. long

e. Leaves pubescent beneath; inner petals 4 mm. long; ripe carpels 1–1·5 cm. long (5) **P. perakensis**

e. Leaves tomentose beneath; inner petals 7 mm. long; ripe carpels 2–2·3 cm. long

f. Nerves 12 pairs, tomentum of leaf short and dense with hairs 1 mm. long, apex acute or shortly acuminate (6) **P. tomentosa**

f. Nerves 16–18 pairs, tomentum of leaf less dense, setose hairs 2 mm. long, apex caudate-acuminate (7) **P. tomentosa** var. **crinita**

(1) **P. pisocarpa** (Bl.) Endl. in Walp. Repert. 1 (1842) 74; Koord. et Val. in Meded. Lands Plantent. 61 (1903) 339; Boerl. in Icon. Bogor. 1 Fasc. 2 (1899) 144; Ridley in Sarawak Mus. Journ. 1/3 (1913) 87; Merr. Enum. Phil. Fl. Plants 2 (1923) 164; Craib, Fl. Siam. Enum. 1 (1925) 47; Ast in Suppl. Fl. Gén. L'Indo-Chine 1 (1938) 90.

Basonym: Guatteria pisocarpa Bl. Bijdr. (1825) 2.

Synonyms: Bocagea pisocarpa Bl. Fl. Jav. Anon. (1830) 90 T. 45. *B. polyandra* Presl, Rel. Haenk. 2 (1835) 77. *Guatteria ramosissima* Wall. Cat. (1832–47) Nos. 7294 and 8006, *nomen nudum. Popowia ramosissima* Hk. f. et Th. Fl. Ind. 1 (1855) 105 et in Fl. Br. Ind. 1 (1872) 68; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 341 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 117 Pl. 159B; Ridley, F.M.P. 1 (1922) 75. *P. polyandra* Merr. in Philip. Journ. Sc. 3 (1908) Bot. 224. *P. rufula* et *P. affinis* Miq. in Ann. Mus. Bot. Lugd.-Bat. 2 (1865) 20. *P. rufescens* Ridley in Kew Bull. (1926) 59.

Shrub or small tree 3–7 m. high with spreading, slender, pliant branches. *Young twigs* rufous-pubescent, the older dark coloured, glabrous, striate and with numerous leaf scars. *Leaves* membranous, elliptic to lanceolate, sometimes slightly obovate, shortly acuminate, base narrowed and slightly rounded, unequal-sided, both surfaces minutely granular like parchment, the upper glabrous except the sunk and slightly pubescent midrib, the lower adpressed-rufous-pubescent on the midrib and veins (the degree of pubescence varying); nerves 6–10 pairs, curving, then rather straight, ascending steeply and running close to edge some distance before terminating; reticulations only visible in the youngest leaves, scalariform, soon quite obscure; length rather variable, 5·5–14 cm.; breadth 2·5–7 cm.; petiole 2–5 mm. long. *Flowers* 5 mm. in diam., extra-axillary and leaf-opposed, single or in small fascicles.

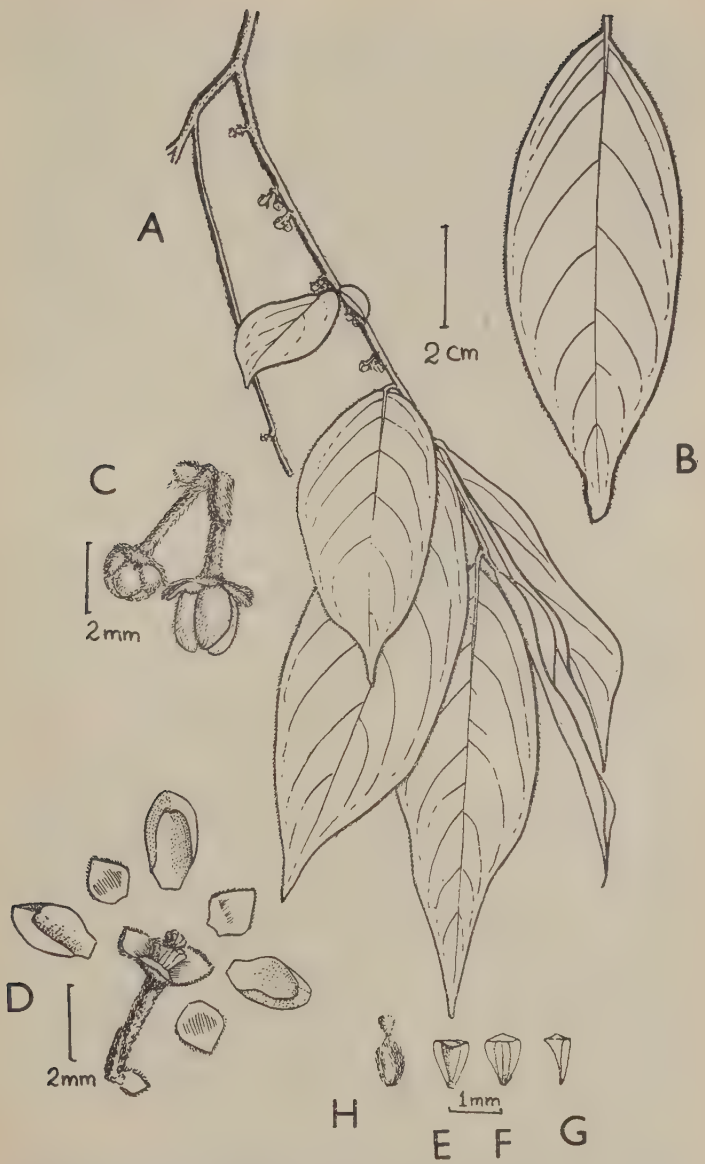


Fig. 44. *Popowia pisocarpa* (Bl.) Endl.

A, Flowering twig. B, Leaf, upper surface. C, Flowers. D, Flower, petals removed. E, Stamen, back view. F, Stamen, front view. G, Stamen. side view. H, Gynoecium.

Pedicels 4–7 mm. long, rufous-tomentose with one basal and one medial, acute, pubescent bract, each about 1·5 mm. long. *Sepals* triangular-ovate, acute, spreading, nearly as large as the outer petals, rusty-tomentose outside, glabrous inside, 2 mm. long. *Petals* creamy white, coriaceous, densely pubescent outside, glabrous inside, rotund, concave; the outer 2 mm. long; the inner slightly longer up to 3 mm., incurved at the apex, lighter in colour, connivent, with a rudimentary claw and three basal spaces where they do not touch as in the *Mitrephoreae*. *Stamens* short, 1 mm. long, broad, the connectives truncate, flat-topped or slightly concave. *Ovaries* 5–6, pubescent with white hairs, style very short, stigmas wedged-shaped to sub-capitate, grooved at the top and adaxially, the surface rough but glabrous, usually adhering to form a disc. *Ripe carpels* globose, granular, slightly pubescent, chocolate-brown when dry, 1 cm. long and 8 mm. in diam.; stalks 2 mm. long. Seed 1, pitted and with a longitudinal circumferential ridge. **Fig. 44.**

DISTRIBUTION: In all the Malayan states, Siam, Indo-China, Borneo, Java, Sumatra, Philippines.

A common species, somewhat variable in length of leaves and degree of pubescence. I have reduced Ridley's *P. rufescens* from Sumatra to this species. It seems to be only a more pubescent form.

(2) **P. pauciflora** Maingay ex Hk. f. et Th. Fl. Br. Ind. 1 (1872) 69; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 341 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 117 Pl. 159A; Ridley, F.M.P. 1 (1922) 75.

Tree. *Young branches* slender, dark-grey, strigose. *Leaves* membranous, elliptic-lanceolate, acuminate, base acute, granular on both surfaces, the upper glabrous, the lower sparsely adpressed-pilose on the midrib and nerves; nerves 9–10 pairs, very oblique; reticulations faint, scalariform but not very straight; length 12·5–15 cm.; breadth 4–5 cm.; petiole 5 mm. long, pubescent. *Flowers* extra-axillary, solitary or in pairs, 7 mm. in diam. *Pedicels* 3–7 mm. long, rusty-strigose, with a basal bract. *Sepals* minute, ovate. *Outer petals* small and like the sepals, pubescent outside, glabrous inside; the inner three times as large, sub-orbicular, concave with inflexed apices. *Stamens* with flat-topped connectives. *Ovaries* about 6, strigose; style slightly elongated, stigma sub-capitate. *Ripe carpels* subsessile, globular, glabrous, purple. *Seed* 1 rugose, erect.

MALACCA: *Maingay 56* (C., Kew) type.

Very rare and not collected again. The above description is taken from the Flora of British India. More details are required.

(3) **P. fusca** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 343 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 120 Pl. 162A; Ridley, F.M.P. 1 (1922) 76.

Shrub or tree 5–15 m. high. *Young twigs* dark rusty-tomentose, later glabrous and striate and with numerous leaf scars. *Leaves* slightly coriaceous, thicker than in *P. pisocarpa,* dull, minutely granular on both surfaces, oval-oblong, obtuse or sub-acute, the base rounded and slightly unequal-sided, the upper surface puberulous, the midrib rusty-pubescent, the lower surface pubescent with thickened pubescent edges; nerves 8–10 pairs, prominent, curving,

Fig. 45. *Popowia fusca* King.

A, Flowering twig. B, Flower and flower bud. C, Outer and inner petals. D, Stamen, front view. E, Stamen, back view. F, Gynoecium. G, Carpel. H, Longitudinal section of carpel.

ascending rather steeply; reticulations fine but usually visible on the lower surface, scalariform; length 8·5–11·5 cm.; breadth 3·5–5·5; petiole 3–4 mm. long, tomentose. *Flowers* slightly foetid, extra-axillary in fascicles on very short bracteate tubercles. *Pedicels* rusty-tomentose, about 5 mm. long with a sub-median minute bract. *Sepals* ovate, obtuse, tomentose outside, glabrous inside, persistent, 2 mm. long. *Petals* cream coloured, tomentose, broadly ovate; the outer 2·5–3 mm. long; the inner 3·5–4 mm. long with incurved apices; both sets united at base in one piece. *Stamens* 1 mm. long, the connectives flat-topped, red. *Ovaries* about 6, oblong, slightly falcate, 1 mm. long, thinly pubescent; style very short, a mere constriction, stigma wedge-shaped, grooved on the top and on the inner side. *Ripe carpels* 1–4, globose-falcate, asymmetrical, pubescent, 1·5–2 cm. long, 1 cm. in diam.; stalks 3–8 mm. long. *Seed* solitary, tuberculate, ridged. **Fig. 45.**

PERAK: Ulu Kerling, *King 8602* (S., C., Kew) type.

PAHANG: Sungei Teku, *Kiah S.F.N. 31923* (S., K.).

SINGAPORE: Bukit Timah, *Nur, 8th October, 1917* (S.); *Sinclair S.F.N. 38444* (S., E.); *Ngadiman S.F.N. 36364* and *34622* (S., K., Kew); North-east end of Mac Ritchie Reservoir, *Sinclair S.F.N. 37939* (S., E.); Bajau, *Ridley, date 1894* (S.); Botanic Garden Jungle, *Ridley, date 1907* (S.).

DISTRIBUTION: Not known elsewhere.

The leaves are thicker and less shining than in *P. pisocarpa* and have thickened pubescent edges; also the reticulations are visible below. The degree of pubescence varies a good deal. *See* notes under *P. velutina* King, a species which may not be distinct from this one.

(4) **P. velutina** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 343 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 120 Pl. 162B; Ridley, F.M.P. 1 (1922) 77.

Very similar to *P. fusca* but leaves shorter, more pubescent beneath, nerves fewer, 6–7 pairs.

PERAK: Gopeng, Kinta, *King 4418* (S., C., Kew) and *4546* (C., Kew) both type material.

DISTRIBUTION: This is the only material known.

This species is extremely close to *P. fusca* and I do not think it is specifically separate. There are three sheets only in Herb. Sing. King says nerves 6–7 pairs for this species and 8–12 for *P. fusca*. However one of these sheets has a large leaf with 8 pairs, the other leaves, it is true are smaller but they may be young. Specimens of *P. fusca* from Bukit Timah, Singapore are every bit as pubescent and in *P. fusca* the pubescence varies a lot.

Although the two species are close and probably the same yet the material at my disposal is too insufficient for any one to come to a definite conclusion so I have refrained from making a reduction.

(5) **P. perakensis** King, Mat. F.M.P. Vol. 1 No. 4 (1892) 343 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 120 Pl. 161B; Ridley, F.M.P. 1 (1922) 76.

Shrub or small tree 2–5 m. high. *Young twigs* dark rusty-tomentose, older glabrous, dark and coarsely striate. *Leaves* membranous, dull, elliptic to oblong-elliptic, very shortly and rather abruptly acuminate, base slightly narrowed and unequal-sided, both surfaces sub-granular, the upper glabrous except the nerves and midrib, the lower pubescent; nerves 8–10 pairs, curving at the midrib, then oblique, running out to the edge, prominent; reticulations slender, faint above, more prominent beneath, some scalariform, the rest a network between the scalariform ones: length 10–12–(21·5) cm.; breadth 4–6–(9·5) cm.; petiole 3–4 mm. long, tomentose. *Flowers* extra-axillary in pairs but not contemporaneous, 5–8 mm. in diam. *Pedicels* 7 mm.–1 cm. long, lengthening after flowering to about 1·5 cm., rather fleshy, strigose with dark, rusty hairs, one minute medial bract and one basal present, each about 1 mm. long. *Sepals* smaller than the petals, ovate-triangular to nearly orbicular, acute, several veined, shaggy-tomentose outside like the pedicels, glabrous inside, persistent, 2·5–3 mm. long. *Petals* coriaceous, ovoid-orbicular, densely whitish shaggy-tomentose outside, glabrous and concave inside; the inner slightly larger, about 4 mm. long, connivent, shortly clawed with 3 basal spaces as in the *Mitrephoreae*. *Stamens* numerous, 1–1·5 mm. long, broadly cuneate with flat-topped or concave connectives (concave due to shrinking when mature or dry). *Ovaries* 10–12, glabrous, elongate; style a mere constriction, stigma sub-capitate, grooved on top and on the inner side. *Ripe carpels* ovoid to oblong, slightly apiculate, glabrescent to glabrous, wine red, changing to purple when dead ripe, taste sweetish, slightly horizontally ridged when dry, 1–1·5 cm. long; stalks brittle, rather fleshy, 8 mm.–1 cm. long. *Seeds* 2–4 with a horizontal circumferential ridge.

PERAK: Maxwell's Hill (Taiping Hill or Waterfall Hill), *Wray 3233* (S., C.); *2055* (S., C., Kew); *2825* (S., C.); *Curtis 1990* (S.); *Haniff* and *Nur S.F.N. 2390* (S., Kew); *Henderson F.M.S. Mus. Herb. 10472* (S.) and *F.M.S. Mus. Herb. 10020* (S.); *Sinclair S.F.N. 38327* (S., E., Kew); Larut, *King Nos. 5603* (C.); *2329* (C., Kew); *3206* (C., Kew); *2922* (C., D.D.); *4145* (C., D.D., E.).

DISTRIBUTION: Not known outside Perak. Type material King and Wray's numbers.

Resembles *P. pisocarpa* slightly but the flowers are larger, also the carpels. They have up to 4 seeds instead of 1. The leaves are larger, more uniformly pubescent on the lower surface, the texture is less granular and the reticulations are visible in adult leaves whereas in *P. pisocarpa* they are never visible in adult leaves but are seen occasionally in the very young leaves. *P. hirta* Miq. bears some resemblance but its leaves are much more hairy and the fruit is larger and globose.

(6) **P. tomentosa** Maingay ex Hk. f. et Th. Fl. Br. Ind. 1 (1872) 70; King, Mat. F.M.P. Vol. 1 No. 4 (1892) 344 et in Ann. Roy. Bot. Gard. Calc. 4 (1893) 121 Pl. 163A; Ridley in Sarawak Mus. Journ. 1/3 (1913) 87 et F.M.P. 1 (1922) 77.

Tree. *Young twigs* softly and densely tomentose with chocolate-brown, 1 mm. long, erect hairs, later glabrous, striate and dark. *Leaves* membranous, oblong-elliptic to elliptic, acute or shortly acuminate, base rounded and unequal-sided, both surfaces especially the margins and midrib densely and softly tomentose with yellowish-brown, erect, 1 mm. long hairs; nerves 12 pairs with an occasional secondary one, curving evenly and running out to margin, prominent; reticulations faint, scalariform but not very straight; length 11–18 cm.; breadth 4–6–(9) cm.; petiole 2–3 mm. long, tomentose. *Flowers* 1 cm. in diam., extra-axillary in small fascicles. *Pedicels* 1 cm. long or more, shaggy-tomentose with a minute basal and medial bract. *Sepals* broadly ovate, acute, tomentose outside like the pedicels, glabrous inside, 5 mm. long. *Petals* cream-coloured, thick, united at the base, villous outside, glabrous and concave inside; outer ovate, 6 mm. long, the inner larger, oblong, connivent, 7 mm. long. *Stamens* 1·5 mm. long with flat-topped connectives. *Ovaries* 7–9, oblong, pubescent, about 2 mm. long; style a mere constriction, stigmas sub-capitate. *Ripe carpels* globose, slightly pubescent, 2–2·3 cm. long and 1·7 cm. in diam.; stalks 1 cm. long. *Seeds* 2–4 orbicular, convex on one side and slightly concave on the other, pitted, with a circumferential ridge.

PENANG: Moniot Road and Telok Bahang, *Curtis 648* (S., C., Kew); *King 1510* (C., Kew); Government Hill, *Burkill S.F.N. 773* (S.); Tiger Hill, *Sinclair S.F.N. 39280* (S., Kew).

PERAK: Gunong Tungul, *Ridley 8003* (S.); Pondok Tanjong, Taiping, *Yeob 1123* (S., K.).

MALACCA: *Maingay 54* (C., Kew) type; Ayer Panas, *Goodenough 1325* (S.); Brisu, *Holmburgh 862* (S.).

SINGAPORE: Mandai Road at edge of Seletar Reservoir, *Sinclair S.F.N. 39540* (S.); Gardens' Jungle, *Ridley 4916* (S.).

DISTRIBUTION: Borneo and Sumatra.

More hairy than any of the other Malayan species and with larger flowers. Nearest to *P. hirta* from Sumatra.

P. tomentosa var. **crinita** J. Sinclair, **var. nov.**

A typo foliis longe acuminatis, pluri-nervatis, setosis differt.

Folia elliptica, acuminata vel caudato-acuminata, 13–18–(28) cm. longa, 5–8·5 cm. lata, pilis c. 2 mm. longis, utrinque et in marginibus petiolisque setosa; ramuli novelli pilis eodem modo obtecti; nervi 16–18 pares.

PERAK: Ulu Bubong, *King 10058* (S., C., D.D., Kew) holotype; *King 10397* (S., C., Kew); near Ulu Kerling, *King 8540* (Kew).
TRENGGANU: Ulu Brang, *Moysey* and *Kiah S.F.N. 33812* (S., Kew).
SELANGOR: Ginting Simpah, *Hume F.M.S. Mus. Herb. 8918* (S.); Semenyih, *Hume F.M.S. Mus. Herb. 8188* (S.).
NEGRI SEMBILAN: Bukit Danan, *Cantley's collector 591* (S.).
DISTRIBUTION: Note known outside Malaya.

The pubescence is less dense than in the type. The hairs are longer, about 2 mm. and are setose. The specimens in the Singapore Herbarium were formerly placed partly under the type of the species and partly under *Pseuduvaria setosa* (*Orophea setosa*) to which there is a certain resemblance but the flowers of the latter are axillary on slender pedicels and the base of the leaf is cordate and not unequal-sided.

Tribe 6. ANNONINEAE

Note. Since the three species of *Annona* found in Malaya are not native but cultivated they are only briefly mentioned here.

38. ANNONA Linn. Sp. Pl. (1753) 536; Safford, Classification of the genus Annona in Contr. United States Nat. Herb. Vol. 18 (1914) 1; Corner, Wayside Trees of Malaya Vol. 1 (1940) 130.

Flowers extra-axillary, sometimes cauliflorous, never axillary. *Sepals* 3, valvate. *Petals* 6 or the inner whorl very small or absent, coriaceous with thick edges and concave at base inside, valvate, inner sometimes imbricate. *Stamens* with convex or apiculate connectives, filament short. *Style* club-shaped, stigma muriculate. *Ovaries* with 1 basal ovule, free at first or united from the beginning into a fleshy syncarp, the surface covered with knobs, bulges, spines or less often smooth.

TYPE OF GENUS: *A. muricata* Linn. Sp. Pl. (1753) 536.
DISTRIBUTION: Mostly Tropical America. Also Trop. Africa. Widely cultivated in the Tropics. Over a hundred species.

KEY

a. Fruit oblong, dull green covered with prickles; petals 6
(1) **A. muricata**

a. Fruit round, not prickly; inner petals very small or absent

b. Fruit nearly smooth, reddish brown; leaves sharply acute or acuminate (2) **A. reticulata**

b. Fruit with knobby, separable bulges, light green; leaves rather blunt (3) **A. squamosa**

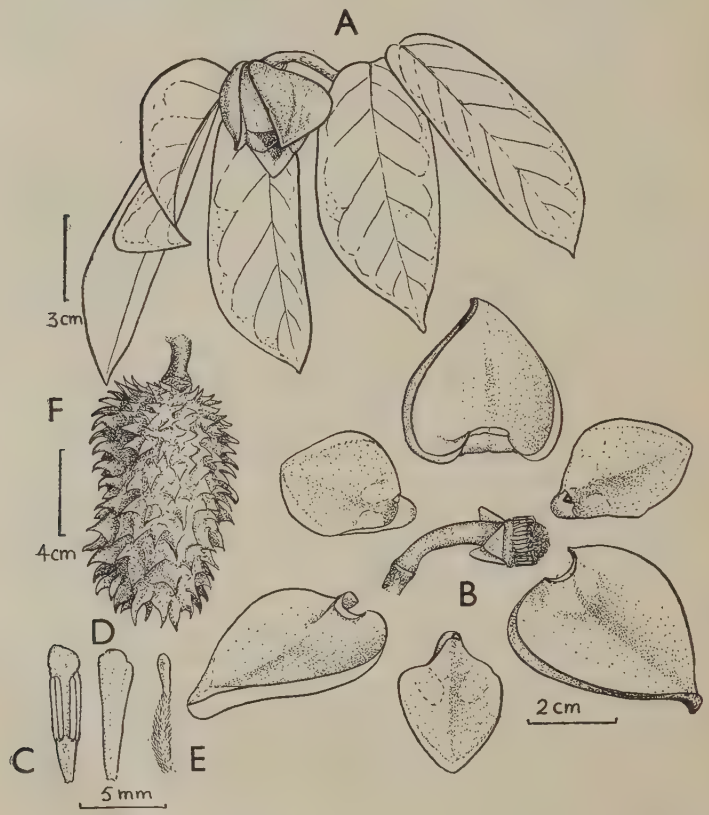


Fig. 46. *Annona muricata* L.
A, Flowering twig. B, Flower, petals detached. C, Stamen, front view. D, Stamen, back view. E, Gynoecium. F, Fruit.

A. muricata Linn., a shrub 10–15 feet high seems to be commoner in Malaya than the others. It is known as the Durian Belanda or Soursop. The edible fruit is often used to flavour milk puddings such as custard. *A. reticulata* Linn., the Custard Apple or Bullock's Heart and *A. squamosa* Linn., the Sweet Sop or Sugar Apple are also cultivated for their edible fruits. **Fig. 46.**

LIST OF COLLECTORS' NUMBERS

ABDUL MAJID—31867 Cyathocalyx sumatranus.

ABDULLA—32936 Xylopia ferruginea.

ABU—2263 Cyathocalyx carinatus; C.F. 2922 Desmos chinensis; C.F. 3340 D. dasymaschalus; 3347 Polyalthia brunneifolia.

AFFRIN—8902 Xylopia ferruginea.

AHMAD, AHMAT, AHAMAD or AHMOD—(variants of spelling)—1213 Polyalthia macropoda; C.F. 2485 Phaeanthus crassipetalus; C.F. 2497 Alphonsea Maingayi; C.F. 2498 Enicosanthum fuscum; C.F. 2922 Desmos chinensis; C.F. 3883 Polyalthia Rumphii; 4069 P. Jenkensii; C.F. 4742 Xylopia ferruginea; C.F. 4926 Polyalthia Rumphii; 4927 P. longifolia; 5051 Goniothalamus Wrayi; C.F. 5056 Desmos chinensis; 5132 Cyathocalyx pruniferus; C.F. 5196 Polyalthia cinnamomea; C.F. 6363 P. sumatrana; C.F. 6363 Enicosanthum fuscum; 9924 Polyalthia macropoda; 13386 Goniothalamus malayanus; 40406 G. tortilipetalus (some of these not marked may have C.F. prefixed).

ALVINS—12 Trivalvaria nervosa; 23 Xylopia ferruginea; 148 Desmos chinensis; 165 Phaeanthus ophthalmicus; 212 Uvaria grandiflora; 396 Oncodostigma monosperma; 438 Polyalthia cauliflora; 440 P. Jenkensii; 446 Oxymitra glauca; 466 Polyalthia cinnamomea; 521 Polyalthia probably lateriflora; 587 Xylopia caudata; 609 Fissistigma Kingii; 628 Mitrella Kentii; 704 Cyathocalyx pruniferus; 737 Trivalvaria nervosa; 854 Xylopia malayana; 917 Artabotrys crassifolius; 1176 Orophea palawanensis; 1215 Cyathocalyx ramuliflorus; 1271 Orophea palawanensis; 1598 Polyalthia cauliflora; 1884 Uvaria grandiflora; 1967 Desmos chinensis; 1982 Artabotrys suaveolens; 2016 Fissistigma lanuginosum; 2025 Desmos chinensis; 2085 Artabotrys venustus; 2139 Xylopia ferruginea; 2153 Fissistigma fulgens; 2164 Mitrella Kentii; 2182 Uvaria javana; 2220 Polyalthia cauliflora var. desmantha; 2225 Fissistigma fulgens; 2273 and 2277 Trivalvaria macrophylla; 2375 Polyalthia obliqua; 3310 Trivalvaria pumila.

ANDERSON—5 Fissistigma fulgens; 6 Desmos dasymaschalus; 7 Fissistigma lanuginosum; 8 Uvaria hirsuta; 98 Popowia pisocarpa; 128 Pseuduvaria taipingensis.

ANNANDALE—S.F.N. 1600 Rauwenhoffia siamensis; S.F.N. 1670 Uvaria grandiflora.

ARIF, MOHAMED—17248 Enicosanthum fuscum; 29604 Monocarpia marginalis.

ARNOT—20548 Uvaria grandiflora; 30661 Polyalthia Motleyana var. glabrescens; 30666 and 33773 Cyathocalyx pruniferus.

AWANG—20678 Alphonsea cylindrica; 20683 Polyalthia cinnamomea; 29602 Alphonsea lucida; 31323 Xylopia magna; 42444 X. elliptica; 47818 Mezzettia Curtisii.

AWANG LELA—2669 Polyalthia obliqua; C.F. 4522 P. Rumphii.

BABA—C.F. 1781 Polyalthia stenopetala; C.F. 1782 P. macropoda; C.F. 1784 Phaeanthus ophthalmicus; 10755 Polyalthia hypoleuca; 10774 P. Rumphii; 10784 Monocarpia marginalis; 10793 Polyalthia hypoleuca; 10797 Monocarpia marginalis.

BEBAS—120; 132; 135 Pseuduvaria rugosa.

BELL—13207 Desmos dasymaschalus.

BEST—*All numbers preceded by S.F.N.*—13890 Monocarpia marginalis; 13895 Goniothalamus Curtisii; 14136 Trivalvaria pumila; 21250 Desmos cochinchinensis; 21262 Pseuduvaria macrophylla.

BOSWELL—12591 Trivalvaria nervosa.

BROWNE—40703 Xylopia ferruginea; 40736 Polyalthia cinnamomea.

BURKILL—*All numbers preceded by S.F.N.*—480 Uvaria grandiflora; 773 Popowia tomentosa; 872 Uvaria hirsuta; 1001 Alphonsea elliptica; 1015 Trivalvaria macrophylla; 1122 Uvaria grandiflora; 1159 Desmos chinensis; 1227 Fissistigma rubiginosum; 1339 Oxymitra latifolia; 1376 Xylopia ferruginea; 2170 Goniothalamus macrophyllus; 2189 Polyalthia Scortechinii; 2197 Artabotrys suaveolens; 2288 Uvaria cordata; 2510 Mitrella Kentii; 2557 Orophea polycarpa; 3163 Cyathostemma viridiflorum; 3239 Sageraea elliptica; 3252 Phaeanthus ophthalmicus; 3393 Uvaria grandiflora; 3511 Artabotrys suaveolens; 4462 Fissistigma manubriatum; 4465 Polyalthia bullata; 4967 P. cauliflora var. Beccarii; 6270 Orophea maculata; 6342 Trivalvaria macrophylla; 6380 Orophea enterocarpa; 6384 Polyalthia cauliflora var. Beccarii;

6423 Fissistigma manubriatum; 6424 Xylopia ferruginea; 6534 Polyalthia cauliflora var. desmantha; 6542 Artabotrys suaveolens; 6549 Fissistigma rubiginosum; 6600 Desmos dasymaschalus; 6843 Cyathocalyx carinatus; 7834 Uvaria leptopoda; 9017 Polyalthia Motleyana var. glabrescens; 9152 Uvaria grandiflora; 13578 Orophea hirsuta.

Burkill and Haniff—*All numbers preceded by S.F.N.*—12339 Rauwenhoffia siamensis; 12349 Goniothalamus Scortechinii; 12414 Uvaria cordata; 12502 Cananga odorata; 12958 Artabotrys venustus; 13023 Pseuduvaria taipingensis; 13332 Uvaria rufa; 13738 Uvaria grandiflora; 13764 Goniothalamus Scortechinii; 13806 Polyalthia clavigera; 15824 Uvaria cordata; 15840 Cyathostemma micranthum; 16052 Polyalthia obliqua; 16071 Uvaria Curtisii; 16073 U. cordata; 16075 Cyathostemma micranthum; 16095 intermediate between Oxymitra biglandulosa and O. glauca; 16098 Enicosanthum membranifolium; 16218 Cyathostemma Wrayi; 16224 Oxymitra latifolia; 16225 Uvaria grandiflora; 16501 Goniothalamus uvarioides; 16519 Xylopia malayana; 16556 Phaeanthus crassipetalus; 16719 Goniothalamus macrophyllus; 16807 Uvaria hirsuta; 16810 Polyalthia obliqua; 16865 Cyathostemma viridiflorum; 16875 Fissistigma fulgens; 16914 Artabotrys suaveolens; 16915 Xylopia ferruginea; 16917 Cyathostemma Wrayi; 17061 Desmos dumosus; 17062 Trivalvaria macrophylla; 17079 Xylopia malayana; 17085 Oxymitra filipes; 17093 Goniothalamus giganteus; 17175 Artabotrys grandifolius; 17226 and 17236 Uvaria rufa; 17246 U. grandiflora; 17247 Xylopia malayana; 17295 Fissistigma rubiginosum; 17298 F. lanuginosum; 17622 and 17626 Desmos chinensis.

Burkill and Holttum—*All numbers preceded by S.F.N.*—7809 Goniothalamus Holttumii; 8507 G. macrophyllus; 8533 Disepalum pulchrum; 8896 Goniothalamus Holttumii; 8957 G. macrophyllus.

Burn-Murdoch—41 Alphonsea Maingayi; 114 Polyalthia sumatrana; 154 P. cauliflora var. Beccarii; 180 and 194 Goniothalamus tenuifolium; S.F.N. 197 Desmos dasymaschalus; 254 Goniothalamus tapis; 268 Pseuduvaria macrophylla; 269 Polyalthia stenopetala; 364 Oncodostigma monosperma; 367 Cyathocalyx olivaceus; 370 Pseuduvaria macrophylla; 390 Xylopia ferruginea; 14441 Polyalthia cinnamomea.

Calomb—24813 Cyathocalyx Scortechinii; 24816 C. carinatus.

CANTLEY—37 Uvaria leptopoda; 127 Cyathocalyx Ridleyi; 128 Pseuduvaria macrophylla; 193 Artabotrys venustus; 245 Phaeanthus ophthalmicus; 329 Cyathostemma viridiflorum; 356 Desmos dumosus; 531 Oxymitra affinis; 591 Popowia tomentosa var. crinita; 2137 Uvaria cordata; 2268 Phaeanthus ophthalmicus; 2339 Fissistigma manubriatum.

CARRIER—24939 Phaeanthus ophthalmicus; 24940 Trivalvaria pumila; 24942 Monocarpia marginalis; 24947 and 24948 Mezzettia leptopoda.

CHARTER—21408 Polyalthia cinnamomea.

CORNER—*All numbers preceded by S.F.N.*—17490 Polyalthia cauliflora var. Beccarii; 21316 Pseuduvaria macrophylla var. sessilicarpa; 21317 Cyathocalyx Ridleyi; 23894 and 25862 Polyalthia sclerophylla; 25939 Goniothalamus calycinus; 25978 Polyalthia cauliflora var. desmantha; 26030 Xylopia caudata; 26096 X. fusca; 26098 X. malayana; 26099 Polyalthia glauca; 26151 Oxymitra glauca, somewhat intermediate approaching biglandulosa; 26152 Pyramidanthe prismatica; 26153 Uvaria leptopoda; 26157 Mitrella Kentii; 26162 Cyathocalyx ramuliflorus; 26163 Polyalthia hypoleuca; 26168 Polyalthia macropoda; 26170 Disepalum anomalum; 28070 Polyalthia sumatrana; 28443 Uvaria leptopoda; 28449 Enicosanthum praestigiosum; 28490 Goniothalamus macrophyllus; 28499 Desmos dasymaschalus; 28500 Fissistigma manubriatum; 28503 Polyalthia cauliflora var. desmantha; 28518 Desmos dasymaschalus; 28554 Goniothalamus macrophyllus; 28580 Uvaria leptopoda; 28600 and 28601 Polyalthia cauliflora var. desmantha; 28604 Goniothalamus malayanus; 28646 Fissistigma manubriatum; 28682 Desmos dasymaschalus var. Wallichii; 28684 Polyalthia cauliflora var. desmantha; 28720 Goniothalamus macrophyllus; 28729 Xylopia caudata; 28739 Goniothalamus malayanus; 28972 Anaxagorea javanica var. dipetala; 29014 Cyathocalyx pahangensis; 29022 Pseuduvaria galeata; 29026 Polyalthia cauliflora var. Beccarii; 29032 Trivalvaria nervosa; 29194 Pseuduvaria galeata; 29198 Cyathocalyx pahangensis; 29274 Polyalthia glauca; 29307 Goniothalamus malayanus; 29330 Polyalthia sumatrana; 29337 Pseuduvaria galeata; 29375 Alphonsea johorensis; 29413 Xylopia caudata; 29417 Mezzettia leptopoda; 29432 Cyathocalyx pahangensis; 29434 Oxymitra latifolia; 29435 O. filipes; 29438 Pseuduvaria macrophylla var. sessilicarpa; 29460 Cyathostemma viridiflorum; 29464

Anaxagorea javanica var. dipetala; 29858 Polyalthia sclerophylla; 29933 Pseuduvaria galeata; 29934 Alphonsea johorensis; 29982 Cyathocalyx pahangensis; 30015 Polyalthia cauliflora var. Beccarii; 30018 Goniothalamus tapis; 30024 Desmos dasymaschalus; 30029 Goniothalamus tenuifolius; 30029A and 30034 Popowia pisocarpa; 30128 Goniothalamus calycinus; 30130 Desmos dasymaschalus; 30146 Fissistigma fulgens; 30159 Oxymitra latifolia; 30175 Artabotrys crassifolius; 30215 Anaxagorea javanica; 30278 Polyalthia probably Rumphii; 30317 Goniothalamus calycinus; 30325 G. macrophyllus; 30337 Enicosanthum cupulare; 30341 Polyalthia sumatrana; 30343 Enicosanthum cupulare; 30349 Anaxagorea javanica; 30358 Popowia pisocarpa; 30363 Monocarpia marginalis; 30382 Xylopia ferruginea; 30384 Trivalvaria pumila; 30400 Fissistigma latifolium var. ovoideum; 30416 Anaxagorea javanica; 30455 Cyathocalyx pahangensis; 30457 Oxymitra argentea; 30505 Cyathocalyx pahangensis; 30569 Mezzettia leptopoda; 30692 Oxymitra filipes; 30729 Marsypopetalum pallidum; 30864 Alphonsea johorensis; 30869 Goniothalamus Ridleyi; 31478 Mitrella Kentii; 31526 Desmos chinensis; 31639 Cananga odorata; 31680 Anaxagorea javanica; 31932 Anaxagorea javanica var. dipetala; 32156 Goniothalamus malayanus; 32237 Enicosanthum praestigiosum; 32301 Artabotrys Wrayi; 32466 Popowia pisocarpa; 32469 Marsypopetalum pallidum; 32494 Oxymitra affinis; 32497 Artabotrys suaveolens; 32765 Enicosanthum praestigiosum; 32799 Polyalthia sclerophylla; 32986 Mezzettia leptopoda; 33141 Polyalthia lateriflora; 33147 Mezzettia leptopoda; 33475 Alphonsea elliptica; 33522 Polyalthia suberosa; 33532 Cananga odorata; 34448 Polyalthia glauca; 34531 Xylopia fusca; 34537 X. ferruginea; 34679 X. caudata; 34827 Cananga odorata; 36941 Polyalthia cauliflora; 36953 Xylopia malayana; 36979 Polyalthia sumatrana; 37069 P. cauliflora; 37070 Trivalvaria nervosa; 37115 Xylopia fusca; 37880 Polyalthia cinnamomea.

Cubitt's Collector—C. F. 800 Polyalthia macropoda; C. F. 987 Phaeanthus ophthalmicus; 1123 Popowia tomentosa; 2201 Phaeanthus ophthalmicus; Forest Dept. 11204 Goniothalamus Wrayi.

Cumming—2339 Fissistigma manubriatum.

Curtis—26 Artabotrys suaveolens; 50 Cyathostemma excelsum; 157 Mitrephora Maingayi; 234 Uvaria grandiflora; 262 U. cordata; 302 Goniothalamus tapis; 310 G. Curtisii; 648

Popowia tomentosa; 727 Desmos Dunalii; 729 Uvaria javana; 730 Mitrella Kentii; 767 Oxymitra calycina; 797 Fissistigma lanuginosum; 807 Desmos cochinchinensis; 813 Pseuduvaria macrophylla; 825 Uvaria pauci-ovulata; 839 Phaeanthus crassipetalus; 841 Uvaria Lobbiana; 843 Fissistigma rubiginosum; 857 and 880 Xylopia stenopetala; 893 Trivalvaria macrophylla; 1014 and 1035 Monocarpia marginalis; 1046 Pyramidanthe prismatica; 1054 Xylopia sub-dehiscens; 1059 Cyathostemma excelsum; 1195 Fissistigma lanuginosum; 1196 F. latifolium var. ovoideum; 1212 Uvaria hirsuta; 1213 Cyathostemma Hookeri; 1234 Uvaria Lobbiana; 1275 Pyramidanthe prismatica; 1277 Polyalthia Motleyana var. glabrescens; 1278 Trivalvaria nervosa; 1279 Pseuduvaria macrophylla var. cymosa; 1281 Polyalthia Motleyana var. oblonga; 1383 Polyalthia cauliflora and also Fissistigma lanuginosum; 1407 Phaeanthus crassipetalus; 1408 Uvaria Lobbiana; 1409 Polyalthia Motleyana var. glabrescens; 1410 Alphonsea Curtisii; 1411 Fissistigma latifolium var. ovoideum; 1412 Uvaria cordata; 1413 Desmos cochinchinensis; 1414 Uvaria javana; 1415 Uvaria Curtisii; 1416 Phaeanthus ophthalmicus; 1417 Cyathocalyx pruniferus; 1422 Artabotrys suaveolens; 1443 Cyathostemma excelsum; 1540 Goniothalamus tenuifolius; 1547 and 1553 Mitrephora Maingayi; 1569 Cyathocalyx sumatranus; 1577 Goniothalamus macrophyllus; 1624 Xylopia sub-dehiscens; 1634 Goniothalamus tapis; 1644 Polyalthia cauliflora var. desmantha; 1645 P. cauliflora; 1647 Desmos dasymaschalus; 1990 Popowia perakensis; 1991 Pseuduvaria taipingensis; 1992 Cyathocalyx olivaceus; 1993 Artabotrys venustus; 1994 Popowia pisocarpa; 2140 Trivalvaria macrophylla; 2162 Goniothalamus giganteus; 2234 Artabotrys suaveolens; 2266 Mezzettia Curtisii; 2277 Enicosanthum membranifolium; 2313 Xylopia ferruginea; 2314 Artabotrys venustus; 2316 Goniothalamus Curtisii; 2426 Desmos dasymaschalus var. Wallichii; 2444 Polyalthia clavigera; 2447 Goniothalamus tenuifolius; 2452 Desmos dasymaschalus; 2470 Polyalthia cinnamomea; 2482 Xylopia elliptica; 2501 Xylopia malayana; 2505 Goniothalamus probably tenuifolius; 2510 Popowia pisocarpa; 2523; 2524 and 2527 Fissistigma rubiginosum; 2533 Polyalthia parviflora; 2538 Goniothalamus macrophyllus; 2576 Desmos chinensis; 2644 Anaxagorea javanica; 2703 Polyalthia Motleyana var. oblonga; 2704 P. lateritia; 2705 Desmos Teysmannii; 2706 Goniothalamus Scortechinii; 2717 Polyalthia Jenkensii; 2744 Uvaria Lobbiana; 2745 Polyalthia hirtifolia; 2746 Alphonsea

Curtisii; 2768 Neo-uvaria acuminatissima; 2775 Polyalthia Jenkensii; 2807 Cananga latifolia; 2808 Cyathostemma micranthum; 2891 Fissistigma manubriatum; 2893 Goniothalamus Ridleyi; 2929 Orophea cuneiformis; 2946 Trivalvaria pumila; 2957 Melodorum fruticosum; 3015 Cyathostemma micranthum; 3113 Orophea maculata; 3119 Desmos chinensis; 3173 Polyalthia lateritia; 3205 Miliusa amplexicaulis; 3437 Disepalum anomalum; 3505 Cyathostemma micranthum; 3562 Goniothalamus macrophyllus; 3563 G. Scortechinii; 3597 Polyalthia hypoleuca; 3611 Xylopia malayana; 3617 Uvaria leptopoda; 3623 Uvaria Curtisii; 3624 Sageraea elliptica and Goniothalamus tapis; 3664 Polyalthia glabra; 3756 Fissistigma fulgens; 3760 Ellipeia cuneifolia.

Denny—116 Xylopia malayana.

Derry—6 Neo-uvaria foetida; 22 Uvaria cordata; 34 Xylopia malayana; 50 Uvaria grandiflora; 100 Goniothalamus Ridleyi; 139 Fissistigma manubriatum; 141 Xylopia ferruginea; 320 Uvaria grandiflora; 401 Polyalthia cauliflora; 413 Desmos dasymaschalus; 429 Uvaria Lobbiana; 474 Cyathocalyx pruniferus; 496 Fissistigma Kingii; 520 F. fulgens; 534 Goniothalamus malayanus; 546 Desmos chinensis; 898 Polyalthia cinnamomea; 926 Mitrella Kentii; 942 Xylopia malayana; 1146 Fissistigma manubriatum; 1173 Xylopia caudata.

Desch—32294 Mezzettia leptopoda.

Dolman—6628 Polyalthia sumatrana; 21487 P. cinnamomea; 28287 Goniothalamus Scortechinii.

Durant—12195 Polyalthia Jenkensii; 28727 Mezzettia leptopoda; 28734 Disepalum pulchrum.

Evans—F.M.S. Mus. Herb. 13267 and F.M.S. Mus. Herb. 13268 Desmos dasymaschalus.

Fox—2122 Uvaria hirsuta; 3818 Desmos dasymaschalus; 5019 Uvaria rufa.

Foxworthy—C.F. 1172 Phaeanthus ophthalmicus; C.F. 2576 and C.F. 2874 Polyalthia stenopetala; C.F. 3131 Goniothalamus Ridleyi; C.F. 3135 Polyalthia obliqua; Forest Dept. 1189 Goniothalamus fulvus; Forest Dept. 5021 Phaeanthus crassipetalus; Forest Dept. 17051 Uvaria pauci-ovulata.

Furtado—S.F.N. 31188 Cananga odorata; S.F.N. 35456 Uvaria hirsuta.

Gani, Mat—9783 Cananga odorata.

GOODENOUGH—1286 Xylopia malayana; 1288 Desmos chinensis; 1291 Goniothalamus malayanus; 1297 Uvaria grandiflora; 1305 Fissistigma latifolium var. ovoideum; 1313 Desmos dumosus; 1315 Cyathocalyx pruniferus; 1325 Popowia tomentosa; 1329 Kingstonia nervosa; 1364 Goniothalamus malayanus; 1366 Xylopia ferruginea; 1375 X. caudata; 1392 Goniothalamus tortilipetalus; 1394 Desmos chinensis; 1429 Phaeanthus ophthalmicus; 1452 Xylopia ferruginea; 1458 Pyramidanthe prismatica; 1459 Uvaria cordata; 1495 U. cordata; 1532 U. grandiflora; 1538 Polyalthia cauliflora var. desmantha; 1666 Desmos chinensis; 1710 Fissistigma manubriatum; 1734 Uvaria grandiflora; 1746 Polyalthia cauliflora; 1778 Polyalthia Jenkensii; 1822 Uvaria javana; 1867 Artabotrys crassifolius; 1903 Sageraea elliptica; 1924 Uvaria grandiflora; 1955 U. cordata; 1981 Polyalthia Rumphii; 2124 Uvaria leptopoda; 2125; 2126 and 2130 U. cordata; 3866 Xylopia malayana; 3905 Fissistigma fulgens; 3952 Xylopia ferruginea var. oxyantha; 5079 Fissistigma fulgens; 10491 Desmos chinensis; 10607 Polyalthia stenopetala; 10608 Fissistigma fulgens.

GRIFFITH—385 Xylopia ferruginea; 386 X. fusca; 387 X. malayana; 388 Fissistigma fulgens; 389 Mitrella Kentii; 393 Fissistigma manubriatum; 395 F. latifolium var. ovoideum; 396 Phaeanthus ophthalmicus; 400 Goniothalamus fulvus; 402 G. malayanus; 413 Polyalthia Rumphii; 414 Goniothalamus macrophyllus; 416 Polyalthia obliqua; 417 Desmos chinensis; 420 Desmos dasymaschalus; 426 Artabotrys crassifolius; 429 A. suaveolens; 434 and 435 Uvaria Lobbiana; 439 U. cordata; 442 Mitrella Kentii; 451 Desmos Dunalii; 453 Fissistigma manubriatum; 456 Oxymitra biglandulosa.

GWYNNE-VAUGHAN—544 Desmos cochinchinensis.

HAMID—C.F. 68 Polyalthia cinnamomea; C.F. 601 Enicosanthum fuscum; C.F. 604 Polyalthia cinnamomea; C.F. 715 Xylopia malayana; C.F. 806 Alphonsea Maingayi; C.F. 888 Polyalthia cinnamomea; C.F. 983 Popowia pisocarpa; C.F. 1050 Uvaria Lobbiana; C.F. 1553 Desmos chinensis; C.F. 1597 Goniothalamus tenuifolius; 1753 Desmos dasymaschalus; C.F. 2580 Mitrella Kentii; C.F. 2588 and C.F. 2842 Polyalthia longifolia; C.F. 2895 Phaeanthus ophthalmicus; C.F. 2909 Polyalthia stenopetala; C.F. 3340 Desmos dasymaschalus; C.F. 3735 Xylopia caudata; C.F. 3802 and C.F. 3820 Polyalthia evecta; C.F. 3855 Goniothalamus undulatus; C.F. 4794 Polyalthia lateriflora; C.F. 4857 Xylopia caudata;

C.F. 4975 Polyalthia stenopetala; C.F. 5457 Xylopia caudata. *The following Forest Dept. Nos.* 987 Phaeanthus ophthalmicus; 2418 Polyalthia Rumphii; 10244 Monocarpia marginalis; 10464 Xylopia sub-dehiscens; 10577 Xylopia caudata; 10617 Miliusa longipes; 10683 Xylopia magna; 16412 Xylopia malayana; 28832 Cananga odorata; 28833 Polyalthia hypoleuca; 33402 Desmos dasymaschalus; 33457 Goniothalamus undulatus.

HAMID and YEOB—C.F. 3267 Polyalthia hypoleuca.

HAMZAH—11354 Monocarpia marginalis.

HANIFF—*All numbers preceded by S.F.N.*—1052 Desmos chinensis; 1068 Cyathostemma micranthum; 3486 Uvaria grandiflora; 3678 Cyathostemma Hookeri; 3701 Desmos cochinchinensis; 3706 Xylopia stenopetala; 3712 Desmos chinensis; 3719 Uvaria cordata; 6987 U. grandiflora; 9127 Cyathocalyx pruniferus; 9141 Fissistigma latifolium var. ovoideum; 10319 Artabotrys suaveolens; 10335 Orophea cuneiformis; 13202 Artabotrys venustus; 14152 Xylopia ferruginea; 14189 Cyathostemma Wrayi; 14198 Pseuduvaria macrophylla; 14210 Goniothalamus Ridleyi; 14243 Oncodostigma monosperma; 14267 Mitrella Kentii; 14318 Cyathocalyx Scortechinii; 14737 Orophea polycarpa; 14923 Polyalthia sclerophylla; 14938 Goniothalamus Ridleyi; 14944 Goniothalamus Scortechinii; 14946 Kingstonia nervosa; 14955 Fissistigma fulgens; 14959 Pseuduvaria rugosa; 14971 Uvaria larep; 14979 Artabotrys suaveolens; 15550 Polyalthia macropoda; 15552 Goniothalamus tortilipetalus; 16010 Cyathostemma micranthum; 16034 Fissistigma lanuginosum; 16035 Goniothalamus macrophyllus; 16046 Polyalthia cauliflora var. Beccarii; 16312 Orophea polycarpa; 17062 Trivalvaria macrophylla; 21004 Polyalthia Hookeriana; 21010 P. hypogaea; 21027 Uvaria cordata; 21042 Goniothalamus Ridleyi; 21084 Polyalthia Motleyana probably typical form.

HANIFF and NUR—*All numbers preceded by S.F.N.*—2085 Anaxagorea javanica; 2089 Polyalthia Hookeriana; 2317 Fissistigma manubriatum; 2351 Goniothalamus macrophyllus; 2390 Popowia perakensis; 2500 Desmos filipes; 2722 Polyalthia cauliflora var. desmantha; 2746 Goniothalamus tavoyensis; 2928 Desmos dasymaschalus; 3571 Trivalvaria pumila; 3841 Artabotrys suaveolens; 3845 Desmos dasymaschalus; 3888 D. cochinchinensis; 3928 Goniothalamus tavoyensis; 3939 Orophea polycarpa; 3972 Miliusa amplexicaulis probably;

4037 Goniothalamus undulatus; 4232 Enicosanthum membranifolium; 4244 Desmos cochinchinensis; 4265 Rauwenhoffia siamensis; 4269 Cyathostemma Wrayi; 4376 Desmos dasymaschalus; 4393 Polyalthia evecta; 5166 Oxymitra glauca; 6942 Monocarpia marginalis; 6951 Anaxagorea javanica var. tripetala; 6957 Polyalthia macropoda; 6971 Oxymitra calycina; 7096 Enicosanthum membranifolium; 7100 Uvaria cordata; 7141 Polyalthia cinnamomea; 7169 Goniothalamus giganteus; 7549 Uvaria grandiflora; 10098 Fissistigma fulgens.

HANIFF and SAAH—S.F.N. 13261 Fissistigma manubriatum.

HASHIM—41 Alphonsea Maingayi; 72 Xylopia ferruginea; 93 Polyalthia stenopetala; 120 Oxymitra filipes; 269 Polyalthia stenopetala; 284 P. cinnamomea; 364 Goniothalamus malayanus; 375 Alphonsea cylindrica; 390 Xylopia ferruginea; 471 Alphonsea Maingayi; 681 Desmos cochinchinensis; C.F. 685 D. dasymaschalus; 692 Fissistigma fulgens; C.F. 1172 Phaeanthus ophthalmicus; C.F. 4936 Cyathostemma Wrayi.

HENDERSON—*The following numbers are preceded by F.M.S. Mus. Herb.*—10020 and 10472 Popowia perakensis; 10524 Goniothalamus macrophyllus; 10554 Pseuduvaria probably rugosa; 10563 Popowia pisocarpa; 10575 Polyalthia stenopetala; 10585 P. sumatrana; 10595 Pseuduvaria rugosa; 10635 Polyalthia cinnamomea; 10656 Anaxagorea javanica; 10692 Popowia pisocarpa; 10711 Pseuduvaria setosa; 10712 and 10716 Orophea enterocarpa; 10721 Stelechocarpus cauliflorus; 10722 Goniothalamus macrophyllus; 10770 Trivalvaria nervosa; 10771 Polyalthia cauliflora var. Beccarii; 11157 Disepalum pulchrum; 11373 P. hypogaea probably; 11421 Polyalthia chrysotricha; 11671 Artabotrys venustus; *The following numbers are preceded by S.F.N.*—17062 Trivalvaria macrophylla; 17736 Disepalum pulchrum; 18216 Polyalthia cinnamomea; 18235 and 18243 Oxymitra Kingii; 18360 Meiogyne virgata; 18457 Desmos dasymaschalus; 19398 Anaxagorea javanica; 19516 Orophea enterocarpa; 19522 Enicosanthum membranifolium; 19594 Oxymitra argentea; 19596 Pseuduvaria macrophylla; 19609 Meiogyne virgata; 19649 Polyalthia obliqua; 19662 Desmos dasymaschalus var. Wallichii; 19672 intermediate between Polyalthia cauliflora and var. Beccarii; 21425 Xylopia stenopetala; 21717 Polyalthia sclerophylla; 21721 Trivalvaria macrophylla; 21793 Pseuduvaria setosa var. major; 21799 Polyalthia obliqua; 21802 Fissistigma Kingii; 21811 Artabotrys

grandifolius; 21844 Polyalthia stenopetala; 21859 Stelechocarpus cauliflorus; 21883 Enicosanthum fuscum; 21993 Desmos dasymaschalus; 22112 Polyalthia sumatrana; 22309 Goniothalamus macrophyllus; 22368 Stelechocarpus cauliflorus; 22443 Orophea polycarpa; 22483 Anaxagorea javanica; 22485 Orophea maculata; 22699 O. enterocarpa; 23046 Uvaria rufa; 23120 Desmos dasymaschalus var. Wallichii; 23201 intermediate between Oxymitra biglandulosa and O. glauca; 23288 Disepalum pulchrum; 23762 Desmos cochinchinensis; 23788 Anaxagorea javanica var. tripetala; 23802 Stelechocarpus cauliflorus; 23841 Miliusa longipes; 24064 Enicosanthum fuscum; 24120 Xylopia fusca; 24148 Cyathocalyx Ridleyi; 24437 Artabotrys crassifolius; 24533 Cyathocalyx sumatranus; 24540 Monocarpia marginalis; 24541 Melodorum aberrans; 24543 Goniothalamus tortilipetalus; 24809 Polyalthia obliqua; 24815 Oxymitra probably glauca; 24841 Goniothalamus tenuifolius; 25020 Miliusa longipes; 25038 Miliusa longipes; 25040 Orophea enterocarpa; 25079 Cyathocalyx pahangensis; 25217 Orophea maculata; 28949 Miliusa parviflora; 29520 Trivalvaria macrophylla; 29522 Goniothalamus Scortechinii; 29534 Anaxagorea javanica; 29539 Popowia pisocarpa; 29554 Polyalthia obliqua; 29664 Cananga odorata; 29713 Pseuduvaria setosa.

Holmburg—756 Neo-uvaria foetida; 862 Popowia tomentosa; 875 Desmos chinensis.

Holttum—*All numbers preceded by S.F.N.*—1766 Desmos dasymaschalus; 3957 Polyalthia cauliflora; 9288 Alphonsea Maingayi; 9665 Mitrella Kentii; 9679 Popowia pisocarpa; 9684 Polyalthia cauliflora var. Beccarii; 9810 P. clavigera; 9827 Desmos chinensis; 9957 Polyalthia cauliflora; 10603 Polyalthia cauliflora var. desmantha; 10611 Pseuduvaria macrophylla var. sessilicarpa; 10769 Goniothalamus macrophyllus; 10852 Cyathocalyx Ridleyi; 10977 Polyalthia hypogaea; 15143 Oxymitra discolor; 15167 Alphonsea elliptica; 15186 Desmos dasymaschalus; 17490 Polyalthia cauliflora var. Beccarii; 17666 Desmos dasymaschalus; 17675 Goniothalamus umbrosus; 18071 Disepalum anomalum; 19852 Polyalthia cauliflora var. Beccarii; 20529 Anaxagorea javanica; 24706 Polyalthia obliqua; 24707 Stelechocarpus cauliflorus; 24749 Orophea maculata; 24753 O. enterocarpa; 24754 Pseuduvaria setosa; 24926 Polyalthia cauliflora var. desmantha; 24932 P. probably stenopetala; 24938 Artabotrys

venustus; 31316 Disepalum pulchrum; 31399 Pseuduvaria monticola; 36393 Enicosanthum praestigiosum; 37352 Polyalthia Motleyana var. glabrescens; 37706 P. glauca.

HULLETT—31 Cananga odorata; 344 Uvaria cordata; 575 Fissistigma fulgens; 576 Meiogyne virgata; 895 Fissistigma fulgens.

HUME—*All numbers preceded by F.M.S. Mus. Herb.*—7070 Trivalvaria macrophylla; 7261 Mitrella Kentii; 7829 Goniothalamus Wrayi; 8151 Polyalthia bullata; 8178 P. macropoda; 8188 Popowia tomentosa var. crinita; 8207 Popowia pisocarpa; 8390 Anaxagorea javanica var. tripetala; 8391 Polyalthia hypogaea; 8398 Pseuduvaria macrophylla; 8448 Goniothalamus Curtisii; 8463 Polyalthia stenopetala; 8478 Polyalthia Motleyana var. oblonga; 8487 Popowia pisocarpa; 8510 Goniothalamus Wrayi; 8720 and 8732 Polyalthia Motleyana var. oblonga; 8745 Orophea enterocarpa; 8754 Pseuduvaria macrophylla; 8800 Popowia pisocarpa; 8904 Polyalthia macropoda; 8907 Phaeanthus ophthalmicus; 8918 Popowia tomentosa var. crinita; 9023 Fissistigma lanuginosum; 9070 Popowia pisocarpa; 9085 Pseuduvaria macrophylla; 9088 Goniothalamus Curtisii; 9174 Artabotrys suaveolens; 9247 Polyalthia stenopetala; 9257 Goniothalamus Curtisii; 9289 Enicosanthum magnoliiflorum; 9331 and 9376 Goniothalamus tenuifolius; 9684 Mezzettia leptopoda; 9822 Fissistigma fulgens.

ISMAIL—17325 Mezzettia leptopoda; 20306 Pseuduvaria setosa.

JA'AMAT—12782 Mitrella Kentii; 14925 Xylopia ferruginea; 15305 Polyalthia Rumphii; 15262 Mezzettia leptopoda; 16501 Miliusa longipes; 16520 Cyathocalyx pahangensis; 16540 Polyalthia cauliflora var. Beccarii; 17029 Trivalvaria pumila; 17455 Pseuduvaria macrophylla; 23925 Polyalthia Motleyana var. glabrescens; 27574 and 28116 Disepalum pulchrum; 28286 Goniothalamus Scortechinii; 35949 G. montanus; 39202 G. uvarioides; 39206 Orophea cuneiformis; 39207 Polyalthia Motleyana var. glabrescens; 39314 P. cauliflora var. desmantha; 39446 Xylopia ferruginea; 40870 Polyalthia bullata; 43162 Phaeanthus ophthalmicus; 44949 Uvaria hirsuta.

JA'AMAT and SOW—36179 Disepalum pulchrum; 37300 Mezzettia leptopoda.

JA'AMAT and TACHUN—39297 Goniothalamus Ridleyi; 39365 Anaxagorea javanica var. tripetala.

JINAL—20351 Polyalthia hypoleuca.

KALONG—20243 Cyathostemma argenteum; 20276 Orophea enterocarpa; 20279 Cananga odorata; 20316 Enicosanthum magnoliiflorum; 20468 Artabotrys suaveolens; 20492 Polyalthia cauliflora var. Beccarii.

KASSIM and JA'AMAT—15344 Phaeanthus ophthalmicus.

KEITH—35 Polyalthia suberosa.

KERR—7101 Polyalthia socia.

KIAH—*All numbers preceded by S.F.N.*—24283 Pseuduvaria macrophylla; 24290 Goniothalamus tortilipetalus; 24291 Polyalthia socia; 24318 P. cinnamomea; 24351 Uvaria rufa; 24358 Desmos chinensis; 24380 Goniothalamus giganteus; 24398 Desmos chinensis; 24399 Goniothalamus undulatus; 31771 Polyalthia cauliflora var. desmantha; 31907 P. stenopetala; 31923 Popowia fusca; 31962 Oxymitra filipes; 31969 Artabotrys suaveolens; 31971 Uvaria cordata; 31985 Xylopia ferruginea; 32017 Enicosanthum praestigiosum; 32033 Polyalthia lateriflora; 32044 Oxymitra glauca; 32058 Orophea enterocarpa; 32067 Polyalthia macropoda; 32069 P. cauliflora var. Beccarii; 32073 Mezzettia leptopoda; 32080 Cyathocalyx pruniferus; 32101 and 32125 Polyalthia cauliflora var. desmantha; 32128 Uvaria pauci-ovulata; 32133 Oncodostigma monosperma; 32139 Alphonsea johorensis; 32145 Desmos dumosus; 32156 Goniothalamus malayanus; 32160 Oncodostigma monosperma; 32169 Polyalthia lateriflora; 32189 P. hypoleuca; 32197 Fissistigma Kingii; 32199 F. lanuginosum; 32320 Monocarpia marginalis; 35115 Popowia pisocarpa; 35127 Desmos dasymaschalus; 35146 Artabotrys grandifolius; 35168 Polyalthia cinnamomea; 35170 Trivalvaria macrophylla; 35179 Cananga odorata; 35218 Pyramidanthe prismatica; 35220 Polyalthia Hookeriana; 35221 Cyathocalyx pruniferus; 35238 Orophea polycarpa; 35269 Polyalthia parviflora; 35276 Orophea hirsuta; 35304 Cyathostemma viridiflorum; 35363 Miliusa amplexicaulis; 35393 Trivalvaria macrophylla; 35402 Orophea hirsuta; 35970 Artabotrys suaveolens; 35984 Monocarpia marginalis; 36000 Polyalthia cinnamomea; 36162 Polyalthia stenopetala; 36168 Sageraea elliptica; 36499 Xylopia malayana; 36941 Polyalthia cauliflora; 37120 Polyalthia glauca; 37140 and 37147 Xylopia malayana; 37239 Orophea palawanensis.

KIAI—8365 Cyathocalyx carinatus; 8375 Polyalthia clavigera.

KING—(*Usually as King's collector, Kunstler*)—118 Fissistigma lanuginosum; 231 Disepalum anomalum; 305 Desmos dasymaschalus; 425 D. dasymaschalus; 478 Uvaria grandiflora var. tuberculata; 482 Desmos cochinchinensis; 484 Orophea maculata; 513 Oymitra filipes; 551 Orophea cuneiformis; 676 Uvaria hirsuta; 687 Pseuduvaria setosa; 692 Goniothalamus tenuifolius; 743 Uvaria hirsuta; 793 Polyalthia cauliflora var. Beccarii; 820 Oxymitra filipes; 838 Phaeanthus ophthalmicus; 906 Polyalthia stenopetala; 947 Desmos chinensis; 960 Uvaria grandiflora var. tuberculata; 1004 Phaeanthus crassipetalus; 1076 P. ophthalmicus; 1087 Fissistigma lanuginosum; 1112 Oxymitra filipes; 1168 Uvaria cordata; 1182 Artabotrys suaveolens; 1195 Oxymitra borneensis var. sumatrana; 1356 Cyathostemma Hookeri; 1371 Mitrella Kentii; 1409 Uvaria grandiflora; 1476 Cyathostemma excelsum; 1510 Popowia tomentosa; 1665 and 1666 Cyathostemma Hookeri; 1668 Uvaria cordata; 1669 Phaeanthus ophthalmicus; 1773 Uvaria rufa; 1826 Goniothalamus Wrayi; 1837 Uvaria cordata; 1915 Oxymitra Kingii; 1944 Polyalthia Motleyana var. oblonga; 1973 Goniothalamus tapis; 1976 and 2002 Polyalthia stenopetala; 2179 Cyathocalyx olivaceus; 2199 Enicosanthum macranthum; 2259 Pseuduvaria macrophylla var. cymosa; 2261 Polyalthia Motleyana var. oblonga; 2329 Popowia perakensis; 2373 Miliusa amplexicaulis; 2375 Anaxagorea javanica var. tripetala; 2437 Polyalthia hypogaea; 2450 Artabotrys suaveolens; 2476 Fissistigma manubriatum; 2622 Uvaria cordata; 2654 Fissistigma fulgens; 2712 Desmos filipes; 2779 Polyalthia stenopetala; 2781 Popowia pisocarpa; 2806 Oxymitra Kingii; 2816 Xylopia fusca; 2835 Cyathocalyx olivaceus; 2869 Orophea cuneiformis; 2873 Oxymitra biglandulosa; 2922 Popowia perakensis; 2935 Uvaria leptopoda; 3009 Oxymitra biglandulosa; 3019 Goniothalamus tenuifolius; 3026 Polyalthia cauliflora var. Beccarii; 3050 Popowia pisocarpa; 3064 Fissistigma Kingii; 3083 Goniothalamus Wrayi; 3113 Polyalthia cauliflora var. desmantha; 3160 P. stenopetala; 3193 Oxymitra calycina; 3206 Popowia perakensis; 3257 Desmos dasymaschalus var. Wallichii; 3292 Uvaria cordata; 3303 Artabotrys suaveolens; 3341 A. suaveolens; 3344 Mitrella Kentii; 3382 Cyathocalyx olivaceus; 3395 Mitrephora Maingayi; 3399 Polyalthia Motleyana var. oblonga; 3615 Artabotrys Wrayi; 3621 Polyalthia sumatrana; 3624 Artabotrys suaveolens;

3699 Goniothalamus tapis; 3712 Xylopia magna; 3725 Artabotrys venustus; 3731 Phaeanthus ophthalmicus; 3746 Artabotrys gracilis; 3767 Polyalthia Rumphii; 3817 Polyalthia clavigera; 3844 Oncodostigma monosperma; 3850 Polyalthia Hookeriana; 3853 Cyathocalyx olivaceus; 3856 Enicosanthum cupulare; 3873 Monocarpia marginalis; 3890 Uvaria hirsuta; 3910 Polyalthia Jenkensii; 3919 Goniothalamus tenuifolius; 3922 and 3932 Pyramidanthe prismatica; 3943 Popowia pisocarpa; 3999 Pheanthus ophthalmicus; 4010 Oxymitra Kingii; 4011 Uvaria larep; 4016 Oxymitra latifolia; 4047 Cyathostemma Hookeri; 4054 Ellipeia cuneifolia; 4063 Fissistigma litseaefolium; 4070 F. Kingii; 4099 Polyalthia Motleyana var. oblonga; 4145 Popowia perakensis; 4154 Oxymitra glauca; 4164 Fissistigma lanuginosum; 4182 Desmos cochinchinensis; 4199 Fissistigma hypoglaucum; 4202 Goniothalamus Wrayi; 4207 Cyathostemma Wrayi; 4270 Polyalthia Rumphii; 4272 Oxymitra calycina; 4279 Polyalthia macropoda; 4283 Orophea hirsuta; 4291 Artabotrys costatus; 4297 Trivalvaria macrophylla; 4299 Desmos dasymaschalus; 4318 Pseuduvaria macrophylla; 4334 Goniothalamus tapis; 4340 Orophea polycarpa; 4350 Pseuduvaria macrophylla; 4359 Desmos dasymaschalus var. Wallichii; 4367 Polyalthia sumatrana; 4384 Pyramidanthe prismatica; 4385 Fissistigma manubriatum; 4392 Artabotrys venustus; 4397 Desmos chinensis; 4401 Oxymitra glauca; 4403 Polyalthia cauliflora var. Beccarii; 4418 Popowia velutina; 4451 Oxymitra glauca; 4454 O. glauca; 4465 Fissistigma hypoglaucum; 4477 Artabotrys grandifolius; 4483 Desmos Dunalii; 4488 Fissistigma latifolium var. ovoideum; 4496 F. rubiginosum; 4508 Anaxagorea javanica; 4522 Polyalthia cauliflora var. Beccarii; 4531 P. Rumphii; 4546 Popowia velutina; 4547 Pseuduvaria macrophylla; 4559 Goniothalamus subevenius; 4564 Desmos dasymaschalus var. Wallichii; 4568 Orophea cuneiformis; 4577 Artabotrys grandifolius; 4578 Orophea maculata; 4579 Desmos Dunalii; 4581 Fissistigma lanuginosum; 4592 Desmos dumosus; 4596 Pyramidanthe prismatica; 4597 Uvaria hirsuta; 4598 U. grandiflora; 4618 Oxymitra Kingii; 4623 Ellipeia cuneifolia; 4626 Goniothalamus tapis; 4635 Cyathostemma Wrayi; 4664 Cananga obovata; 4701 Mitrephora Maingayi; 4702 Polyalthia hypoleuca; 4722 Goniothalamus malayanus; 4729 Polyalthia bullata; 4744 Fissistigma manubriatum; 4745 Polyalthia sumatrana; 4746 Goniothalamus malayanus; 4752 G. macrophyllus; 4787 Uvaria Lobbiana; 4788 Mitrephora

vulpina; 4804 Polyalthia bullata; 4831 Enicosanthum congregatum; 4857 Desmos cochinchinensis; 4877 D. dasymaschalus; 4883 Fissistigma fulgens; 4885 F. lanuginosum; 4930 Uvaria cordata; 4946 Cyathocalyx olivaceus; 4948 Fissistigma manubriatum; 4974 Oxymitra latifolia; 4985 Fissistigma lanuginosum; 4986 F. litseaefolium; 4987 Artabotrys gracilis; 5040 Desmos dasymaschalus; 5060 Fissistigma hypoglaucum; 5073 Goniothalamus tenuifolius; 5082 Fissistigma rubiginosum; 5105 Goniothalamus tapis; 5126 Oxymitra Kingii; 5137 Pyramidanthe prismatica; 5141 Polyalthia Motleyana var. oblonga; 5150 Artabotrys oxycarpus; 5160 Popowia pisocarpa; 5186 Fissistigma manubriatum; 5209 Mitrella Kentii; 5210 Cyathostemma excelsum; 5221 Fissistigma manubriatum; 5228 Goniothalamus Scortechinii; 5242 Mitrephora Maingayi; 5258 Mitrella Kentii; 5268 Mitrephora Maingayi; 5291 Desmos filipes; 5302 Trivalvaria nervosa; 5310 Polyalthia hypoleuca; 5312 Fissistigma lanuginosum; 5313 Xylopia sub-dehiscens; 5319 Ellipeia cuneifolia; 5344 Fissistigma Kingii; 5356 Monocarpia marginalis; 5369 Mitrella Kentii; 5387 Alphonsea lucida; 5399 Meiogyne virgata; 5451 Cyathostemma excelsum; 5453 Fissistigma fulgens; 5461 Desmos dumosus; 5463 Cyathocalyx olivaceus; 5495 Polyalthia Hookeriana; 5514 Enicosanthum cupulare; 5520 Desmos dumosus; 5544 Phaeanthus ophthalmicus; 5550 Polyalthia Hookeriana; 5562 Oxymitra latifolia; 5603 Popowia perakensis; 5605 Artabotrys oxycarpus; 5610 Pyramidanthe prismatica; 5636 Trivalvaria pumila; 5696 Cananga odorata; 5702 Polyalthia brunneifolia; 5710 Trivalvaria pumila; 5712 Desmos dasymaschalus; 5733 Polyalthia Motleyana var. oblonga; 5734 Miliusa longipes; 5745 Goniothalamus Ridleyi; 5754 and 5776 Uvaria cordata; 5806 Fissistigma hypoglaucum; 5810 Pyramidanthe prismatica; 5815 Goniothalamus tenuifolius; 5817 Fissistigma latifolium var. ovoideum; 5825 Fissistigma latifolium var. ovoideum; 5832 Orophea cuneiformis; 5837 Fissistigma rubiginosum; 5844 Ellipeia cuneifolia; 5851 Orophea polycarpa; 5857 Cyathostemma viridiflorum; 5874 Orophea maculata; 5882 Goniothalamus tapis; 5889 Trivalvaria macrophylla; 5899 Oxymitra biglandulosa; 5920 Uvaria hirsuta; 5940 Fissistigma lanuginosum; 5943 Trivalvaria macrophylla; 5945 Uvaria javana; 5962 Fissistigma manubriatum; 5979 Uvaria grandiflora; 5981 Cyathostemma excelsum; 5984 Desmos chinensis; 5991 Phaeanthus ophthalmicus; 6026 Oxymitra latifolia; 6027

Enicosanthum fuscum; 6045 Ellipeia cuneifolia; 6125 Polyalthia Rumphii; 6135 Cyathocalyx pruniferus; 6177 Meiogyne virgata; 6183 Polyalthia hypoleuca; 6201 Fissistigma fulgens; 6206 Mitrephora Maingayi; 6236 Mitrella Kentii; 6293 Fissistigma latifolium var. ovoideum; 6358 Polyalthia Motleyana var. oblonga; 6370 Mitrephora Maingayi; 6411 Mitrella Kentii; 6416 Fissistigma latifolium var. ovoideum; 6432 Mitrella Kentii; 6463 Uvaria hirsuta; 6465 Polyalthia Motleyana var. oblonga; 6482 Cyathostemma Hookeri; 6496 Pyramidanthe prismatica; 6498 Fissistigma latifolium var. ovoideum; 6499 Artabotrys venustus; 6508 Mitrephora Maingayi; 6513 Uvaria cordata; 6524 Artabotrys oblongus; 6527 Goniothalamus tapis; 6530 Polyalthia lateriflora; 6531 Fissistigma latifolium var. ovoideum; 6547 Polyalthia Hookeriana; 6551 P. sumatrana; 6558 Oxymitra affinis; 6643 Enicosanthum cupulare; 6653 Cyathocalyx olivaceus; 6654 Enicosanthum macranthum; 6655 Polyalthia pachyphylla; 6666 Cyathocalyx olivaceus; 6710 C. pruniferus; 6748 Uvaria pauci-ovulata; 6780 Oxymitra calycina; 6789 Cyathocalyx pruniferus; 6819 Mitrella Kentii; 6845 Polyalthia Rumphii; 6879 Oxymitra latifolia; 6968 Artabotrys venustus; 6981 Mitrephora Maingayi; 7048 Fissistigma fulgens; 7053 F. latifolium typical form; 7079 Goniothalamus Scortechinii; 7097 Alphonsea Kingii; 7100 A. cylindrica; 7105 Polyalthia lateritia; 7139 Goniothalamus malayanus; 7162 Miliusa longipes; 7222 Artabotrys grandifolius; 7275 Phaeanthus crassipetalus; 7276 Fissistigma Kingii; 7318 Meiognye virgata; 7323 Orophea hastata; 7352 Miliusa longipes; 7353 Polyalthia sumatrana; 7382 Monocarpia marginalis; 7386 Orophea dodecandra; 7448 Goniothalamus Scortechinii; 7451 Orophea dodecandra; 7460 Artabotrys suaveolens; 7462 Orophea enterocarpa; 7472 Oxymitra Kingii; 7498 Trivalvaria macrophylla; 7501 Polyalthia Hookeriana; 7516 Polyalthia pachyphylla; 7522 Oxymitra calycina; 7534 Monocarpia marginalis; 7537 Goniothalamus Wrayi; 7543 Artabotrys gracilis; 7544 Uvaria cordata; 7547 Mitrephora Maingayi; 7566 Uvaria leptopoda; 7582 Monocarpia marginalis; 7613 Enicosanthum congregatum; 7617 Polyalthia cauliflora var. desmantha; 7629 Stelechocarpus cauliflorus; 7630 Enicosanthum cupulare; 7652 Orophea maculata; 7658 Polyalthia stenopetala; 7667 Orophea dodecandra; 7671 Polyalthia Motleyana var. oblonga; 7694 Polyalthia lateriflora; 7695 Orophea enterocarpa; 7720 Popowia pisocarpa; 7733

Artabotrys Maingayi; 7743 Popowia pisocarpa; 7765 Fissistigma lanuginosum; 7772 Desmos dumosus; 7803 Polyalthia cauliflora var. Beccarii; 7814 P. Hookeriana; 7816 Desmos chinensis; 7822 Fissistigma fulgens; 7825 Ellipeia cuneifolia; 7829 Xylopia ferruginea; 7832 Fissistigma manubriatum; 7868 Ellipeia cuneifolia; 7890 Fissistigma lanuginosum; 7924 F. hypoglaucum; 7937 Polyalthia Rumphii; 7946 P. brunneifolia; 7951 P. Rumphii; 7984 P. Rumphii; 7995 Popowia pisocarpa; 8088 Goniothalamus malayanus; 8119 Fissistigma latifolium var. ovoideum; 8131 Cyathostemma excelsum; 8224 Stelechocarpus cauliflorus; 8225 Goniothalamus subevenius; 8230 Fissistigma latifolium typical form; 8233 Mitrephora Maingayi; 8234 Orophea cuneiformis; 8238 Pseuduvaria ? rugosa; 8241 Cyathocalyx Scortechinii; 8246 Orophea dodecandra; 8250 Orophea cuneiformis; 8257 O. polycarpa; 8260 Goniothalamus subevenius; 8285 Pseuduvaria setosa; 8292 Goniothalamus Scortechinii; 8346 Enicosanthum fuscum; 8348 Goniothalamus Ridleyi; 8350 Uvaria hirsuta; 8352 Fissistigma manubriatum; 8366 and 8375 Fissistigma Kingii; 8381 Desmos dumosus; 8384 Artabotrys crassifolius; 8389 Oxymitra biglandulosa; 8397 Orophea enterocarpa; 8441 Goniothalamus giganteus; 8453 Phaeanthus ophthalmicus; 8526 Cyathostemma Hookeri; 8540 Popowia tomentosa var. crinita; 8543 Uvaria Curtisii; 8585 Mitrephora Maingayi; 8602 Popowia fusca; 8617 Desmos dumosus; 8620 Mitrephora Maingayi; 8631 Melodorum aberrans; 8635 Xylopia ferruginea; 8639 Goniothalamus Curtisii; 8670 Xylopia ferruginea; 8681 Oxymitra latifolia; 8746 O. biglandulosa; 8753 Goniothalamus Wrayi; 8761 Polyalthia sumatrana; 8777 Cyathostemma excelsum; 8833 Oxymitra glauca; 8841 O. latifolia; 8843 Desmos chinensis; 8847 Orophea hastata; 10010 Polyalthia Rumphii; 10014 Oxymitra filipes; 10028 Desmos dumosus; 10037 Cyathocalyx pruniferus; 10039 Enicosanthum fuscum; 10041 Uvaria hirsuta; 10044 Phaeanthus crassipetalus; 10053 Trivalvaria pumila; 10058 Popowia tomentosa var. crinita; 10079 Xylopia sub-dehiscens; 10100 Cananga odorata; 10101 Desmos chinensis; 10110 Enicosanthum fuscum; 10118 Fissistigma latifolium var. ovoideum; 10126 Goniothalamus Wrayi; 10130 Enicosanthum fuscum; 10133 Artabotrys suaveolens; 10136 Popowia pisocarpa; 10149 Polyalthia sumatrana; 10184 Artabotrys costatus; 10192 Oxymitra glauca; 10198 Polyalthia Motleyana var. oblonga; 10258 Oxymitra latifolia; 10275 Fissistigma Kingii; 10293 Ellipeia cuneifolia; 10359

Mitrephora Maingayi; 10397 Popowia tomentosa var. crinita; 10404 Enicosanthum fuscum; 10405 Xylopia ferruginea; 10418 Fissistigma latifolium var. ovoideum; 10420 Mitrephora Maingayi; 10447 Polyalthia lateriflora; 10464 Oxymitra glauca; 10512 Goniothalamus Wrayi; 10516 Cyathocalyx pruniferus; 10517 Artabotrys suaveolens; 10522 Fissistigma hypoglaucum; 10539 Uvaria javana; 10548 Goniothalamus Curtisii; 10602 Mitrella Kentii; 10604 Oxymitra calycina; 10606 Oxymitra glauca; 10616 Trivalvaria pumila; 10633 Alphonsea cylindrica; 10663 Phaeanthus ophthalmicus; 10664 Goniothalamus Wrayi; 10666; 10682 Orophea hastata; 10708 Goniothalamus giganteus; 10727 Xylopia malayana; 10756 Polyalthia macropoda; 10765 Desmos Dunalii; 10768 Goniothalamus Wrayi; 10778 Oxymitra filipes; 10807 Polyalthia Rumphii; 10818 Xylopia sub-dehiscens; 10874 Uvaria javana; 10875 U. cordata; 10878 U. cordata; 10880 Xylopia ferruginea; 10939 Orophea hastata; 10964 Polyalthia lateritia; 10965 Enicosanthum magnoliiflorum; 10975 Polyalthia Rumphii; 10977 Pseuduvaria rugosa; 10982 Oxymitra filipes; 11787 Uvaria Lobbiana; 13578 Orophea hirsuta; 32005 Mitrella Kentii.

KINSEY—C. F. 1863 Monocarpia marginalis.

KLOSS—6836 Goniothalamus undulatus.

LAKE and KELSALL—4039 Goniothalamus malayanus; 4045 Polyalthia cauliflora; 4047 P. angustissima; 4048 Oxymitra glauca.

LAMBAK—C.F. 2709 Uvaria rufa; C.F. 2722 Cananga odorata; C.F. 3141 Cyathocalyx pahangensis.

LELA and JANTAN—4169 Polyalthia hypoleuca.

LIEW—37744 Xylopia malayana.

LUDIN—1875 Xylopia ferruginea var. oxyantha.

MAHAMAD, MAHAMUD, MAHMUD, MOHAMUD, MOHMUD—(*Variants of spelling—The numbers are taken consecutively but there may be more than one collector involved.*) 824 Cyathocalyx pahangensis; 2116 Fissistigma fulgens; 2123 Uvaria cordata; 2797 Goniothalamus malayanus; 2800 Polyalthia Hookeriana; 3305 Pseuduvaria setosa; C.F. 3723 Goniothalamus fuscus; C.F. 3747 Desmos dasymaschalus; 14958 D. dasymaschalus; 15550 Goniothalamus Macranii; 17161 Popowia pisocarpa; 17241 Enicosanthum fuscum; 17571

Pseuduvaria setosa; 20409 Enicosanthum fuscum; 23360 Goniothalamus tenuifolius; 33306 Cyathocalyx sumatranus (Some of these may have C.F. prefixed).

MAINGAY—22 Kingstonia nervosa; 23 Uvariâ grandiflora; 24 U. cordata; 25 U. javana; 26 U. hirsuta; 27 U. Lobbiana; 29 Cyathostemma macranthum; 30 Uvaria Lobbiana; 31 Ellipeia cuneifolia; 32 Artabotrys crassifolius; 33 A. suaveolens; 34 A. Maingayi and A. pleurocarpus; 35 Cananga odorata and another sheet 35 type of Cyathostemma viridiflorum; 36 Cyathostemma excelsum and another sheet C. viridiflorum; 37 Polyalthia cinnamomea; 38 Desmos Dunalii; 39 D. chinensis; 40 D. dasymaschalus; 41 Polyalthia stenopetala; 42 and 43 Desmos dumosus; 44 Polyalthia obliqua; 45 P. Rumphii in part, other part is P. Jenkensii; 46 Polyalthia Jenkensii; 47 Trivalvaria nervosa; 48 Polyalthia cauliflora var. desmantha; 49 Oxymitra biglandulosa; 50 Polyalthia hypoleuca; 51 P. lateritia; 52 Popowia pisocarpa; 53 Trivalvaria macrophylla; 54 Popowia tomentosa; 55 Neo-uvaria foetida; 56 Popowia pauciflora; 57 Oxymitra latifolia; 58 O. glauca; 59 O. affinis; 60 O. filipes; 61 O. discolor; 62 Goniothalamus macrophyllus; 63 G. malayanus; 64 Pseuduvaria macrophylla; 65 Mitrephora Maingayi; 66 Polyalthia glabra; 67 Phaeanthus ophthalmicus; 68 and 69 Fissistigma latifolium var. ovoideum; 70 Fissistigma manubriatum; 71 F. lanuginosum; 72 F. manubriatum; 73 F. fulgens; 74 Pyramidanthe prismatica; 75; 76 and 77 Mitrella Kentii; 78 Pyramidanthe prismatica; 79 and 80 Xylopia caudata; 81 X. malayana; 82 X. elliptica; 83 X. magna; 84 X. malayana; 85 X. ferruginea; 86 X. fusca; 88 and 89 Orophea enterocarpa; 90 Cyathocalyx pruniferus; 91 C. ramuliflorus; 92 Meiogyne virgata; 93 Enicosanthum magnoliiflorum; 94 Monocarpia marginalis; 95 Meiogyne virgata; 96 Polyalthia lateriflora; 98 Alphonsea Maingayi; 99 A. elliptica; 100 Oncodostigma monosperma; 101 Polyalthia sclerophylla; 102 Mezzettia leptopoda; 104 Uvaria pauciovulata; 105 Anaxagorea javanica; 107 Alphonsea elliptica; 108 Pyramidanthe prismatica; 109 Desmos chinensis; 1053; 1349; 1349A Neo-uvaria foetida.

MARCAN—729 Uvaria rufa.

MAT—2120 Goniothalamus Curtisii; 2123 Uvaria cordata; 17947 Polyalthia Rumphii.

MEAD—32700 Polyalthia stenopetala.

MEH—8914 and 8982 Polyalthia Rumphii; 9043 Anaxagorea javanica var. tripetala; 10156 Polyalthia Rumphii; 17861 Xylopia ferruginea; 17870 Monocarpia marginalis.

MILLS—S.F.N. 21422 Cananga odorata.

MILLS and HENDERSON—S.F.N. 15075 Polyalthia hypogaea; S.F.N. 15076 Orophea maculata.

MOH—10195 Monocarpia marginalis.

MONGCHIE—4417 Fissistigma fulgens.

MOYSEY—S.F.N. 33627 Goniothalamus montanus.

MOYSEY and KIAH—*All numbers preceded by S.F.N.*—33346 Goniothalamus Ridleyi; 33607 G. macrophyllus; 33613 Pseuduvaria nervosa; 33627 Goniothalamus montanus; 33642 G. calycinus; 33722 Pseuduvaria macrophylla; 33740 Polyalthia sumatrana; 33741 Goniothalamus calycinus; 33751 Polyalthia Hookeriana; 33759 P. sumatrana; 33766 Pseuduvaria macrophylla var. sessilicarpa; 33812 Popowia tomentosa var. crinita; 33879 Sageraea elliptica; 33941 Goniothalamus macrophyllus; 33947 Polyalthia dumosa.

MURTON—5 Uvaria leptopoda.

NGADIMAN—*All numbers preceded by S.F.N.*—34508 Cyathocalyx ramuliflorus; 34604 Xylopia ferruginea; 34622 Popowia fusca; 34623 Mezzettia leptopoda; 34691 Polyalthia Jenkensii; 34739 Polyalthia cauliflora var. desmantha; 34933 somewhat intermediate between P. cauliflora and var. Beccarii; 35583 P. sumatrana; 36125 Xylopia malayana; 36199 Mezzettia leptopoda; 36364 Popowia fusca; 36432 Uvaria pauci-ovulata; 36457 Xylopia malayana; 36461 Mezzettia leptopoda; 36644; 36690 and 36697 Polyalthia hypoleuca; 36775 Goniothalamus malayanus; 36820 Mitrella Kentii; 36853 Xylopia ferruginea var. oxyantha; 36855 Cyathocalyx pahangensis; 36859 Polyalthia Hookeriana; 36868 Xylopia fusca; 36881 X. caudata; 36893 Mitrella Kentii; 37003 and 37006 Xylopia malayana; 37013 Cyathocalyx Ridleyi.

NGAH—24935 Mezzettia leptopoda.

NUR—*All numbers preceded by S.F.N.*—794 Polyalthia cauliflora var. desmantha; 1243 Enicosanthum membranifolium; 1365 Fissistigma rubiginosum; 2540 Cyathostemma viridiflorum; 2542 Polyalthia cauliflora var. desmantha; 2644 Artabotrys uncinatus; 7571 Cyathocalyx sumatranus; 11047 Goniothalamus macrophyllus; 11127 Polyalthia chrysotricha; 11191 Goniothalamus Curtisii; 11316 Artabotrys venustus; 11341

Goniothalamus Holttumii; 11591 Pseuduvaria macrophylla; 11672 Polyalthia cauliflora var. Beccarii; 11673 P. bullata; 11718 Pseuduvaria macrophylla; 11759 Polyalthia brunneifolia; 11771 Uvaria hirsuta; 11787 Desmos filipes; 11818 Phaeanthus ophthalmicus; 11918 Polyalthia stenopetala; 12128 Orophea enterocarpa; 18585 Polyalthia cauliflora var. desmantha; 18865 Meiogyne virgata; 18876 Uvaria Lobbiana; 19986 Cyathocalyx pahangensis; 24636 Goniothalamus Ridleyi; 32586 Artabotrys suaveolens; 33955 Polyalthia hypoleuca; 33972 Xylopia fusca; 34023 Polyalthia hypoleuca; 34040 Mitrephora Maingayi; 34061 Goniothalamus malayanus; 34277 G. Curtisii; 34312 Fissistigma latifolium var. ovoideum; 34314 Cyathocalyx pruniferus; 35169 and 36155 Oncodostigma monosperma.

NUR and FOXWORTHY—*All numbers preceded by S.F.N.*—11954 Anaxagorea javanica; 11955 Goniothalamus macrophyllus; 11973 Oxymitra filipes; 11994 Polyalthia cinnamomea; 12010 P. cauliflora var. Beccarii; 12063 P. lateritia; 12157 Goniothalamus rotundisepalus.

NUR and KIAH—*All numbers preceded by S.F.N.*—7738 Polyalthia Rumphii; 7766 P. macropoda; 7773 P. socia probably; 7774 Goniothalamus tapis.

OMAR—8523 Phaeanthus ophthalmicus; 8539 Cyathocalyx pruniferus; 8548 Phaeanthus ophthalmicus; 8854 Xylopia ferruginea; 9974 and 13009 Artabotrys uncinatus.

OSMAN—(Forest Dept.) 23856 Mitrella Kentii; 28306 Polyalthia cauliflora; 28334 Goniothalamus tenuifolius; 28359 Polyalthia stenopetala; 28402 Pseuduvaria setosa; 28407 Goniothalamus tenuifolius; 28422 Polyalthia obliqua; 28429 Cyathostemma excelsum; 28431 Uvaria cordata; 28464 Anaxagorea javanica; 28471 Goniothalamus uvarioides; 28526 Neo-uvaria acuminatissima; 28540 Goniothalamus tortilipetalus; 29280 Polyalthia obliqua.

PAWANCHE—13796 Polyalthia sumatrana; 14667 Enicosanthum congregatum.

PENDAH—799 Polyalthia clavigera.

PUT—3637 Polyalthia socia.

RAMAN, ABDUL—C.F. 604 Polyalthia cinnamomea; C.F. 2832 Alphonsea elliptica.

RIDLEY—295 and 356 Mitrella Kentii; 429 Polyalthia macropoda; 439 Artabotrys suaveolens; 1056 Xylopia ferruginea; 1078 Desmos chinensis; 1115 Uvaria rufa; 1380 U. cordata; 1563

Desmos chinensis; 1565 Cananga odorata; 1586 Desmos dumosus; 1823 Fissistigma fulgens; 2112 Cyathostemma viridiflorum; 2114 Mitrella Kentii; 2115 Fissistigma fulgens; 2117 Mitrella Kentii; 2121 Desmos dasymaschalus; 2124 Uvaria leptopoda; 2423 Alphonsea Curtisii; 2426 Desmos cochinchinensis; 2428 Orophea maculata; 2429 Phaeanthus ophthalmicus; 2632 Orophea maculata; 2649 O. polycarpa; 2984 Cyathostemma micranthum; 2985 Pseuduvaria macrophylla var. cymosa; 2986 Polyalthia asteriella; 3094 intermediate between P. cauliflora and var. Beccarii; 3100 Pseuduvaria macrophylla; 3105 Polyalthia sclerophylla; 3106 Fissistigma lanuginosum; 3286 Phaeanthus ophthalmicus; 3466 Cyathocalyx Ridleyi; 3532 Xylopia caudata; 3630a Artabotrys Wrayi; 3641a Fissistigma fulgens; 3847 F. lanuginosum; 3863 Polyalthia Rumphii; 3952 Xylopia ferruginea var. oxyantha; 4182 Polyalthia Scortechinii; 4183 Disepalum anomalum; 4189 Pseuduvaria macrophylla var. sessilicarpa; 4409 Mezzettia leptopoda; 4454 Cyathocalyx ramuliflorus; 4456 Goniothalamus Ridleyi; 4457 Meiogyne virgata; 4558 Xylopia ferruginea var. oxyantha; 4587 Fissistigma fulgens; 4708 Uvaria leptopoda; 4709 Miliusa longipes; 4710 Polyalthia cauliflora; 4711 Cyathocalyx Ridleyi; 4712 Fissistigma manubriatum; 4790 Cyathostemma Hookeri; 4806 Artabotrys suaveolens; 4808 Fissistigma latifolium var. ovoideum; 4813 Polyalthia angustissima; 4916 Popowia tomentosa; 4919 Ellipeia cuneifolia; 5078 Pyramidanthe prismatica; 5082 Ellipeia cuneifolia; 5099 Fissistigma lanuginosum; 5366 F. rubiginosum; 5371 Goniothalamus tenuifolius; 5374 and 5375 Desmos chinensis; 5377 Pseuduvaria macrophylla var. cymosa and Goniothalamus macrophyllus; 5822 Uvaria leptopoda; 5835 Artabotrys suaveolens; 5851 Polyalthia clavigera; 5917 P. angustissima; 5921 Xylopia caudata; 5980 Polyalthia cauliflora; 5992 Mezzettia leptopoda; 6051 Artabotrys Wrayi; 6052 A. suaveolens; also Fissistigma lanuginosum; 6176 Cyathocalyx ramuliflorus; 6227 Goniothalamus Ridleyi; 6228 Desmos dasymaschalus; 6231 Polyalthia cauliflora; 6305 Desmos dumosus; 6343 Oxymitra borneensis var. sumatrana; 6344 Pyramidanthe prismatica; 6345 Mitrella Kentii; also Fissistigma manubriatum; 6346 Desmos dasymaschalus; 6347 D. dasymaschalus var. Wallichii; 6348 Polyalthia sumatrana; 6349 Goniothalamus macrophyllus; 6351 Xylopia ferruginea var. oxyantha; 6352 X. ferruginea; 6353 Goniothalamus Ridleyi; 6428 Oxymitra excisa; 6482

Popowia pisocarpa; 6526 Polyalthia Rumphii; 6757 Goniothalamus tapis; 6758 Alphonsea Maingayi; 6759 Xylopia malayana; 6760 Phaeanthus ophthalmicus; 6770 Mitrella Kentii; 6812 Desmos dasymaschalus; 7018 Fissistigma rubiginosum; 7020 Goniothalamus tenuifolius; 7022 Polyalthia cauliflora var. desmantha; 7279 Stelechocarpus cauliflorus; 7280 Polyalthia cauliflora; 7281 P. brunneifolia and Popowia pisocarpa; 7282 and 7283 Goniothalamus Scortechinii; 7283 also Pseuduvaria macrophylla; 7284 Polyalthia stenopetala; 7361 Desmos chinensis; 7964 Goniothalamus tenuifolius; 7989 Polyalthia cauliflora; 7994 Goniothalamus Scortechinii; 7995 Polyalthia cauliflora; 7996 P. pumila; 7997 Goniothalamus Ridleyi; 8001 Mitrephora Maingayi; 8002 Popowia pisocarpa; 8003 Popowia tomentosa; 8050 Polyalthia angustissima; 8113 P. cauliflora; 8116 Meiogyne virgata; 8117 Polyalthia cauliflora; 8119 Orophea ? hastata; 8246 Trivalvaria macrophylla; 8247 Uvaria Lobbiana; 8248 Pseuduvaria macrophylla var. cymosa; 8251 Phaeanthus ophthalmicus; 8276 Goniothalamus Curtisii; 8290 Goniothalamus tenuifolius; 8394 Popowia pisocarpa; 8405 Goniothalamus tapis; 8450 Miliusa longipes; 8600 Uvaria javana; 8627 Goniothalamus Curtisii; 8628 Trivalvaria macrophylla and Cananga odorata; 8629 Mitrephora Maingayi; 8630 Popowia pisocarpa; 8781 Goniothalamus Ridleyi; 8783 Fissistigma manubriatum; 8784 Phaeanthus ophthalmicus; 9211 Uvaria Lobbiana; 9383 U. cordata; 9429 Cyathostemma Hookeri; 9434 Xylopia sub-dehiscens; 9438 Phaeanthus ophthalmicus; 9442 Anaxagorea javanica; 9621 Orophea maculata; 9655 Pseuduvaria macrophylla; 9678 Polyalthia Motleyana var. oblonga; 8938 Xylopia caudata; 10033 Fissistigma manubriatum; 10038 Polyalthia glauca; 10055 Artabotrys suaveolens; 10195 Polyalthia stenopetala; 10203 Cyathostemma excelsum; 10287 Orophea dodecandra; 10315 Desmos dumosus; 10320 intermediate between Polyalthia cauliflora and var. Beccarii; 10625 Goniothalamus Curtisii; 10639 Xylopia ferruginea; 10764 Polyalthia Rumphii; 10809 Oxymitra latifolia; 10853 Artabotrys crassifolius; 10921 A. costatus; 11057 Polyalthia cauliflora var. Beccarii; 11254 Meiogyne virgata; 11916 Uvaria larep; 11925 Cyathocalyx olivaceus; 11993 Polyalthia Rumphii; 12178 Uvaria pauciovulata; 12215 U. leptopoda; 12572 Desmos dasymaschalus; 12574 Uvaria javana; 13387 Orophea enterocarpa; 13389 Goniothalamus tenuifolius; 13464 Popowia pisocarpa; 13465 Polyalthia angustissima; 13505 Polyalthia sclerophylla;

13514 Desmos dasymaschalus var. Wallichii; 13515 Polyalthia cauliflora; 13516 Mitrella Kentii; 13517 Polyalthia cauliflora; 14047 Popowia pisocarpa; 14092 Pseuduvaria macrophylla; 14093 Polyalthia stenopetala; 14094 Goniothalamus tenuifolius; 14095 G. Wrayi; 14098 Trivalvaria pumila; 14099 Polyalthia cauliflora var. Beccarii; 14149 Phaeanthus crassipetalus; 14592 Polyalthia stenopetala; 14594 Desmos dasymaschalus var. Wallichii; 14595 Polyalthia stenopetala; 14596 Goniothalamus Scortechinii; 14597 G. Ridleyi; 14598 Goniothalamus tenuifolius; 14599 Pseuduvaria probably macrophylla; 14600 and 14601 P. macrophylla var. cymosa; 14646 Miliusa amplexicaulis; 14725 Oxymitra desmoides; 14734 Anaxagorea javanica var. tripetala; 15177 Cananga latifolia; 15178 and 15179 Desmos dasymaschalus; 15180 Uvaria grandiflora; 15181 U. rufa; 15239 and 15340 Miliusa parviflora; 15342 Orophea cuneiformis; 15688 and 15759 Goniothalamus macrophyllus; 15783 Desmos dasymaschalus; 15893 Polyalthia parviflora; 15904 Oxymitra discolor; 16012 Disepalum pulchrum.

Ridley and Goodenough—1643 Goniothalamus malayanus; 2118 G. Ridleyi.

Robinson—6297 Desmos dasymaschalus.

Saamin—14194 Xylopia magna.

Samsudin—Forest Dept. 18246 Mezzettia leptopoda.

Scortechini—18b Uvaria grandiflora; 36 Goniothalamus Wrayi; 69b Cananga odorata; 80 Miliusa longipes; 88b Polyalthia cauliflora var. Beccarii; 101b Orophea cuneiformis; 106b O. maculata; 121b Uvaria rufa; 131b Cyathostemma Wrayi; 137 and 137b Popowia pisocarpa; 152b Polyalthia hypoleuca; 164b and 167 Orophea polycarpa; 172 Goniothalamus macrophyllus; 172b G. tapis; 182b Polyalthia stenopetala; 198b Trivalvaria pumila; 206b Polyalthia Rumphii; 320 Popowia pisocarpa; 326 Goniothalamus macrophyllus; 331 Artabotrys pleurocarpus; 342 Desmos filipes; 469b Cyathocalyx olivaceus; 471b Desmos dasymaschalus; 488 Artabotrys Scortechinii; 494 Trivalvaria nervosa; 566b Polyalthia stenopetala; 578b Goniothalamus giganteus; 592b Polyalthia asteriella; 601 P. dumosa; 618b Desmos chinensis; 660 Polyalthia Motleyana var. oblonga; 660b Goniothalamus Curtisii; 693 Monocarpia marginalis; 710 Miliusa longipes; 720 Fissistigma lanuginosum and Uvaria hirsuta; 824 Disepalum pulchrum; 853 Oxymitra calycina; 865 Mitrella Kentii; 907 Uvaria grandiflora; 1123

Fissistigma fulgens; 1328 Artabotrys suaveolens; 1364 Desmos dasymaschalus; 1500 Polyalthia Rumphii; 1514 Pseuduvaria macrophylla var. cymosa; 1540 Cyathostemma excelsum; 1549 Fissistigma fulgens; 1576 Goniothalamus Ridleyi; 1584 Orophea cuneiformis; 1608 Artabotrys grandifolius; 1632 A. pleurocarpus; 1671 Fissistigma fulgens; 1698 Cyathocalyx pruniferus; 1725 Mitrephora Maingayi; 1754 Orophea cuneiformis; 1764 O. dodecandra; 1771 O. maculata; 1781 Cyathocalyx Scortechinii; 1800 Polyalthia sumatrana; 1803 Goniothalamus tenuifolius; 1877 Mitrella Kentii; 1882 Polyalthia cauliflora var. Beccarii; 1925 Cananga odorata; 1926 Enicosanthum congregatum; 1946 Melodorum aberrans; 1959 Xylopia ferruginea; 1970 Fissistigma hypoglaucum; 1990 Uvaria Scortechinii; 2001 Polyalthia Rumphii; 2012 Artabotrys Lowianus; 2048 Enicosanthum macranthum; 2072 Cyathocalyx pruniferus; 2108 Polyalthia cauliflora var. Beccarii; 2112 Xylopia magna; 2115 Phaeanthus ophthalamicus; 2182 Polyalthia stenopetala; 2186 Orophea dodecandra; 2189 O. enterocarpa; 4116 Desmos dasymaschalus; 5000 Cyathostemma viridiflorum; 5001 Popowia pisocarpa; 5002 Pseuduvaria macrophylla.

SEIMUND—*All numbers preceded by F.M.S. Mus. Herb.*—493 and 494 Polyalthia stenopetala; 919 Cyathocalyx Scortechinii; 967 Polyalthia cauliflora var. desmantha.

SHAM—23745 Goniothalamus giganteus.

SHAMSUDIN—18246 Mezzettia leptopoda.

SINCLAIR—*All numbers preceded by S.F.N.*—37298 Desmos dasymaschalus; 37929 and 37930 Cyathocalyx Ridleyi; 37937 Popowia fusca; 38249 P. pisocarpa; 38444 P. fusca; 38449 Cyathocalyx Ridleyi; 38819 Oxymitra Kingii; 38820 Pyramidanthe prismatica; 38827 Popowia perakensis; 38828 Polyalthia sumatrana; 38830 Xylopia sub-dehiscens; 38845 Artabotrys crassifolius; 38851 Oxymitra desmoides; 38860 Polyalthia macropoda; 38870 Oxymitra biglandulosa; 38944 Polyalthia lateriflora; 38993 Xylopia caudata; 39030 Fissistigma rubiginosum; 39031 Phaeanthus crassipetalus; 39049 Mezzettia Curtisii; 39149 Polyalthia Hookeriana; 39226 P. cauliflora; 39246 Cyathostemma viridiflorum; 39247 Uvaria grandiflora; 39248 Fissistigma lanuginosum; 39280 Popowia tomentosa; 39339 Desmos cochinchinensis; 39341 Cyathostemma Wrayi; 39345 Polyalthia Motleyana var. glabrescens; 39350 Trivalvaria macrophylla; 39351 Uvaria Lobbiana; 39356 Goniothalamus umbrosus; 39381 G. tapis; 39431

Uvaria leptopoda; 39472 Meiogyne virgata; 39478 Xylopia ferruginea; 39525 Trivalvaria nervosa; 39534 Xylopia fusca; 39540 Popowia tomentosa; 39576 Xylopia caudata; 39621 Polyalthia hypogaea; 39623 Pseuduvaria macrophylla; 39628 Polyalthia bullata; 39652 Uvaria Curtisii; 39664 Artabotrys Wrayi; 39690 Xylopia magna; 39820 Alphonsea elliptica; 39865 Goniothalamus fulvus; 39871 Oxymitra argentea; 39874 Pseuduvaria macrophylla; 39897 Orophea enterocarpa; 39907 Pseuduvaria cerina; 39920 Polyalthia sumatrana; 39928 Anaxagorea javanica var. tripetala; 39939 Polyalthia cinnamomea; 39940 Uvaria hirsuta; 39950 Fissistigma litseaefolium; 39956 Monocarpia marginalis; 39965 Artabotrys probably crassifolius; 39980 Goniothalamus macrophyllus.

Soh or Sow—(Forest Dept.) 15062 Desmos Dunalii; 15075 Artabotrys crassifolius; 15078 Polyalthia cauliflora; 15082 Cyathocalyx pahangensis; 15083 Desmos dasymaschalus var. Wallichii; 15090 Xylopia sub-dehiscens; 15105 Polyalthia sumatrana; 15114 P. sclerophylla; 15131 Xylopia fusca; 15136 Alphonsea elliptica; 15403 Goniothalamus fulvus; 15457 Polyalthia cauliflora var. Beccarii; 17031 Goniothalamus Curtisii; 34646 Anaxagorea javanica; 41045 Goniothalamus Scortechinii; 46010 Monocarpia marginalis; 46021 Trivalvaria macrophylla; 46049 Polyalthia Hookeriana; 66038 P. stenopetala.

Soh and Motan—51983 and 52125 Mezzettia Curtisii.

Sommerville—29222 Xylopia ferruginea.

South and Soh—64475 and 64773 Kingstonia nervosa.

Spare—*All numbers preceded by S.F.N.*—3742 Goniothalamus tenuifolius; 33296 Artabotrys suaveolens; 34479 Uvaria cordata; 36042 Desmos chinensis; 36049 Artabotrys suaveolens.

Speldewinde—5394 Monocarpia marginalis.

Strugnell—10537 Uvaria cordata; 11225 Polyalthia sumatrana; 11235 Cyathocalyx pruniferus; 11246 and 12120 Monocarpia marginalis; 12135 Goniothalamus Curtisii; 12136 Oncodostigma monosperma; 12140 Uvaria grandiflora; 12466 Mitrephora vulpina; 12666 Polyalthia stenopetala; 12678 Mitrella Kentii; 12688 Xylopia ferruginea; 12691 Cyathocalyx carinatus; 12697 Polyalthia macropoda; 12728 P. stenopetala; 12785 and 12859 Xylopia ferruginea; 13002 Fissistigma fulgens; 13004 Enicosanthum magnoliiflorum; 13021

Polyalthia macropoda; 13058 Fissistigma latifolium var. ovoideum; 13079 Polyalthia cinnamomea; 13085 Uvaria cordata; 13376 Fissistigma lanuginosum; 13379 Monocarpia marginalis; 13384 Enicosanthum magnoliiflorum; 13390 Cyathostemma argenteum; 13608 Mitrella Kentii; 13969 Cyathocalyx carinatus; 20201 Polyalthia stenopetala; 20443 Goniothalamus Ridleyi; 20483 Polyalthia macropoda; 22258 Desmos dasymaschala var. Wallichii; 22309 and 27090 intermediate between Polyalthia cauliflora and var. Beccarii; 27302 P. cauliflora var. Beccarii; 31812 Cananga odorata.

SUDIN—41882 Polyalthia hypoleuca.

SYED ALI—23360 Goniothalamus tenuifolius; 23447 Xylopia ferruginea; 23490 Polyalthia Rumphii; 23492 P. hypoleuca; 23553 P. cinnamomea.

SYMINGTON—14482 Xylopia ferruginea var. oxyantha; 14487 Cyathocalyx pruniferus; 16962 Desmos chinensis; 18162 Polyalthia sumatrana; 20169 Fissistigma lanuginosum; 20519 Desmos chinensis; 20831 Pseuduvaria monticola; 22109 Trivalvaria pumila; 22611 Goniothalamus Curtisii; 22645 Popowia pisocarpa; 22658 Enicosanthum membranifolium; 22713 Goniothalamus uvarioides; 22717 Popowia pisocarpa; 22755 Fissistigma latifolium var. ovoideum; 22768 Platymitra siamensis; 22801 Goniothalamus Wrayi; 22904 and 23014 Trivalvaria pumila; 22962 Polyalthia brunneifolia; 23105 Anaxagorea javanica; 24122 Mitrephora Maingayi; 24126 Alphonsea cylindrica; 24165 Goniothalamus Macranii; 24174 Orophea enterocarpa; 24179 Polyalthia brunneifolia; 24197 P. obliqua; 24216 P. Motleyana var. glabrescens; 24226 P. cinnamomea; 24250 Orophea hastata; 24357 Mitrephora Maingayi; 24430 Anaxagorea javanica; 24521 Cyathostemma argenteum; 24522 Anaxagorea javanica; 25455 Phaeanthus ophthalmicus; 25622 Polyalthia Motleyana var. glabrescens; 25822 Anaxagorea javanica var. tripetala; 26781 Desmos dasymaschalus; 26845 Polyalthia cauliflora var. Beccarii; 26969 Artabotrys crassifolius; 27056 Trivalvaria pumila; 29811 Goniothalamus Curtisii; 29893 Popowia pisocarpa; 29940 Polyalthia sclerophylla; 30766 P. longifolia; 30781 Trivalvaria macrophylla; 31054 and 32662 Mezzettia leptopoda; 32696 Polyalthia hypogaea; 35754 P. cauliflora var. desmantha; 37608 Goniothalamus rotundisepalus; 37640 G. macrophyllus; 37915 Desmos chinensis; 39393 Mitrella Kentii; 39455 Mitrephora Maingayi; 40534

Desmos chinensis; 40641 Xylopia ferruginea; 40649 X. ferruginea var. oxyantha; 40650 Cyathocalyx pruniferus; 40756 Goniothalamus malayanus; 40789 Anaxagorea javanica var. tripetala; 42970 Uvaria javana; 43275 Mezzettia leptopoda; 43528 Monocarpia marginalis; 43529 Mezzettia leptopoda; 43531 Mitrephora Maingayi; 43629 Polyalthia cinnamomea; 43630 Enicosanthum fuscum; 43632 Xylopia malayana; 43634 Phaeanthus ophthalmicus; 43676 Polyalthia hypoleuca; 43694 Cananga odorata; 43776 Platymitra siamensis; 44012 Polyalthia glauca; 44042 Cyathocalyx carinatus; 44729 Xylopia malayana; 45808 Polyalthia hypoleuca; 49834 Cyathocalyx sumatranus; 49927 C. carinatus.

SYMINGTON and KIAH—*All numbers preceded by S.F.N.*—28827 Goniothalamus tenuifolius; 28912 Polyalthia cauliflora var. Beccarii; 28921 Goniothalamus tenuifolius.

SYMINGTON and SOH—45817 Polyalthia stenopetala.

TACHUN—23235 Xylopia caudata; 23743 Polyalthia Rumphii; 43467 Goniothalamus Curtisii.

TACHUN and SOW—16867 Xylopia ferruginea; 17034 Monocarpia marginalis.

TALIB—C.F. 3036 Polyalthia macropoda.

TASI, MD.—34115 Cyathocalyx Scortechinii.

VESTERDAL—4v Melodorum fruticosum; 4z Goniothalamus undulatus.

WALL and CATALOGUE—6416; 6416a; 6416b Artabotrys suaveolens; 6420 and 6421a Desmos dasymaschalus; 6425 D. Dunalii; 6454 Fissistigma lanuginosum; 6455 Pyramidanthe prismatica; 6458 and 6458b Uvaria hirsuta; 6469a Goniothalamus giganteus; 6474 Cyathostemma micranthum; 6474a Mitrella Kentii; 6477 Cyathostemma excelsum; 6478 Xylopia ferruginea var. oxyantha; 6481 Phaeanthus ophthalmicus; 6484 Mitrephora Maingayi; 6485; 6485b; 6485c; 6485f Uvaria grandiflora; 6486 U. cordata; 6487a U. cordata; 6488 U. grandiflora; 7294 Popowia pisocarpa; 7421 Sageraea elliptica; 8006 Popowia pisocarpa.

WALTON—28388 Polyalthia lateriflora; 28394 Xylopia ferruginea; 29090 Polyalthia cinnamomea; 32826 Enicosanthum membranifolium.

WATSON—C.F. 3234 Polyalthia stenopetala; For. Dept. 3177 somewhat intermediate between P. cauliflora and var. Beccarii; 5868 Cyathocalyx Ridleyi; 23941 Desmos chinensis.

WHITBY—24456 Anaxagorea javanica.

WOOLLEY—10333 Enicosanthum fuscum.

WRAY—157 Goniothalamus Wrayi; 181 Polyalthia cauliflora var. Beccarii; 184 Pseuduvaria macrophylla; 188 Oxymitra latifolia; 437 Goniothalamus Wrayi; 482 Oxymitra glauca; 495 Polyalthia cauliflora var. Beccarii; 505 P. clavigera; 534 Goniothalamus macrophyllus; 558 Polyalthia stenopetala; 560 Polyalthia cauliflora var. Wrayi; 572 Desmos dasymaschalus; 609 D. filipes; 642 Ellipeia cuneifolia; 727 Monocarpia marginalis; 731 Mitrella Kentii; 806 Pseuduvaria taipingensis; 987 Goniothalamus Wrayi; 994 Polyalthia hypogaea; 1017 Goniothalamus Wrayi; 1079 Mitrella Kentii; 1112 Pyramidanthe prismatica; 1293 Polyalthia stenopetala; 1311 P. sumatrana; 1331 Fissistigma fulgens; 1339 Ellipiea cuneifolia; 1354 Pseuduvaria macrophylla; 1378 Fissistigma manubriatum; 1379 Oxymitra latifolia; 1416 Xylopia ferruginea; 1432 Enicosanthum fuscum; 1806 Oxymitra calycina; 1808 Polyalthia Motleyana var. oblonga; 1822 Goniothalamus Wrayi; 1823 Mitrella Kentii; 1826 Uvaria larep; 1833 Oxymitra latifolia; 1837 U. cordata; 1965 Fissistigma Kingii; 2054 Cyathocalyx olivaceus; 2055 Popowia perakensis; 2075 Polyalthia clavigera; 2082 Oxymitra argentea; 2085 Fissistigma manubriatum; 2086 Pyramidanthe prismatica; 2093 Fissistigma fulgens; 2145 Cyathostemma Hookeri; 2149 Mitrella Kentii; 2191 Polyalthia Motleyana var. oblonga; 2194 Polyalthia stenopetala; 2234 Artabotrys Wrayi; 2236 Goniothalamus tenuifolius; 2298 Desmos dasymaschalus; 2301 Cyathocalyx pruniferus; 2307 Phaeanthus ophthalmicus; 2415 Goniothalamus tapis; 2419 Polyalthia lateriflora; 2427 Desmos dasymaschalus; 2439 Uvaria leptopoda; 2441 Fissistigma fulgens; 2447 Pyramidanthe prismatica; 2469 Orophea maculata; 2568 Fissistigma lanuginosum; 2596 Fissistigma latifolium var. ovoideum; 2597 Oxymitra calycina; 2619 Desmos dumosus; 2622 Uvaria cordata; 2628 Polyalthia dumosa; 2640 Fissistigma manubriatum; 2663 Artabotrys Wrayi; 2693 A. venustus; 2715 Fissistigma fulgens; 2726 Goniothalamus tapis; 2732 G. tenuifolius; 2748 Anaxagorea javanica; 2759 Desmos Dunalii; 2805 Polyalthia Motleyana var. oblonga; 2818 Cyathocalyx olivaceus; 2825 Popowia perakensis; 2877 Monocarpia marginalis; 2888 Ellipeia cuneifolia; 2889 Mitrella Kentii; 2892 Enicosanthum macranthum; 2899 Oxymitra

glauca; 2906 Goniothalamus Wrayi; 2909 Polyalthia stenopetala; 2926 Goniothalamus tapis; 2942 Pseuduvaria macrophylla var. cymosa; 2972 Fissistigma lanuginosum; 2978 Polyalthia dumosa; 2987 Goniothalamus macrophyllus; 3013 and 3044 Oxymitra affinis; 3065 Mitrella Kentii; 3083 Oxymitra Kingii; 3096 Phaeanthus crassipetalus; 3109 Mitrephora Maingayi; 3142 Polyalthia Rumphii; 3173 Popowia pisocarpa; 3194 Xylopia elliptica; 3224 Fissistigma latifolium typical form; 3222 Popowia perakensis; 3252 Goniothalamus tenuifolius; 3253 Fissistigma latifolium var. ovoideum; 3283 Cyathostemma Wrayi; 3286 Artabotrys oxycarpus; 3292 Uvaria cordata; 3300 Phaeanthus ophthalmicus and one sheet with P. ophthalmicus and P. crassipetalus together; 3303 Artabotrys suaveolens; 3338 Orophea cuneiformis; 3339 Oxymitra Kingii; 3352 Uvaria grandiflora; 3365 Anaxagorea javanica; 3376 Kingstonia nervosa; 3379 Goniothalamus tenuifolius; 3382 Mitrephora Maingayi; 3386 Oxymitra Kingii; 3400 Anaxagorea javanica var. tripetala; 3427 Popowia pisocarpa; 3437 Melodorum aberrans; 3441 Artabotrys suaveolens; 3454 Goniothalamus Ridleyi; 3461 Phaeanthus ophthalmicus; 3468 Cyathostemma acuminatum; 3472 Trivalvaria macrophylla; 3487 Melodorum aberrans; 3502 Pseuduvaria macrophylla var. cymosa; 3507 Phaeanthus crassipetalus; 3531 Orophea hastata; 3558 Goniothalamus tenuifolius; 3562 Xylopia elliptica; 3569 Phaeanthus ophthalmicus; 3633 Melodorum aberrans; 3685 Goniothalamus Scortechinii; 3697 Orophea hastata; 3749 and 3801 Goniothalamus Scortechinii; 3867 Disepalum pulchrum var. angustifolium; 3870 Polyalthia cauliflora var. desmantha; 3944 P. Hookeriana; 3948 Trivalvaria nervosa; 3949 Desmos dasymaschalus var. Wallichii; 3963 Fissistigma lanuginosum; 3989 Monocarpia marginalis; 3996 Goniothalamus tapis; 4006 Artabotrys Wrayi; 4172 A. suaveolens; 4182 Phaeanthus ophthalmicus; 4206 Polyalthia hypogaea; 4207 Cyathocalyx olivaceus; 4210 Artabotrys suaveolens.

Wyatt-Smith—*Kepong Field Nos.*—64560 Alphonsea Maingayi; 64603 Xylopia ferruginea; 64725 Polyalthia sclerophylla; 64728 Xylopia magna; 64798 Alphonsea elliptica; 64809 Mezzettia leptopoda; 64833 Alphonsea Maingayi; 64847 Mezzettia leptopoda; 65139 and 65530 Goniothalamus Macranii; 71080 Polyalthia lateriflora.

Wyatt-Smith and Soh—*Kepong Field Nos.*—64489 Cyathocalyx pruniferus; 64606 Polyalthia Rumphii.

YAKIM, MD.—C.F. 512 Xylopia ferruginea; C.F. 528 Alphonsea Maingayi.

YASSIN—4492 Polyalthia lateriflora; 4500 Neo-uvaria foetida.

YEOB or YEOP—C.F. 830 Cyathocalyx pahangensis; C.F. 831 Sageraea lanceolata; C.F. 841 Cananga odorata; C.F. 3141 Cyathocalyx pahangensis; C.F. 3144 Goniothalamus tenuifolius; 3151 Trivalvaria nervosa; C.F. 3158 Mitrephora Maingayi; C.F. 3176 Goniothalamus fulvus; 3185 Rauwenhoffia siamensis; C.F. 3620 Goniothalamus malayanus; C.F. 3644 Alphonsea elliptica; C.F. 5128 Cyathostemma Wrayi; *Forest Dept.*—830 Cyathocalyx pahangensis; 1123 Popowia tomentosa; 1451 Oxymitra alpina; 3234 Polyalthia stenopetala; 5037 Xylopia elliptica; 5889 Goniothalamus macrophyllus; 12189 Uvaria cordata.

YUSUS MD.—28910 Mezzettia leptopoda.

ZIN MD.—27741 Xylopia ferruginea.

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New species, new varieties, new names, new combinations in **bold-faced type**, synonyms in *italics*. Species occurring in Malaya have the author's name appended. Species marked with a star are illustrated.

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PALMAE MALESICAE—XVIII*

Two New Calamoid Genera of Malaysia

By C. X. FURTADO

WHILE STUDYING specific affinities in the genus Calamus with the view to revising the Malayan material in the Singapore herbarium, a few species were noticed to be so anomalous as to justify their separation from Calamus; and as they do not form a uniform group, two new genera have been proposed here, namely CORNERA and SCHIZOSPATHA. The first genus is named after Dr. E. J. H. Corner of the University of Cambridge, England, who, when Assistant Director of the Botanic Gardens, Singapore, contributed much to our knowledge of the Malayan vegetation in general; the second name has been coined to emphasize the fact that in this calamoid genus the spadix branches emerge by puncturing the spathes.

The species in both these genera are climbing and their spadices are much abbreviated, in Cornera terminating each in a short filiform appendix. None of the species are cirriferous, but one species in Cornera (*C. conirostris*) produces a short cirrus which however bears also abbreviated leaflets to make the leaves sub-cirriferous in the terminology adopted for describing rattans. The primary spathes, though in texture and armature reminding one of Daemonorops and of its relatives, are conspicuously tubular at least in part, the leaf-sheaths are flagelliferous and the female calyx is as nearly as long as the corolla—three characters that show the clear affinities of these two genera with Calamus.

The primary spathes in Cornera are armed, coriaceous, ventricose or inflated towards the apex which in each spathe terminates often in an ear-shaped limb having a long or short beak. The primary branches of the spadix have each a stout axis which, growing in a straight line with the main axis below, appears as if it were the continuation of the latter, while the main axis above is so much more slender than the branch-axis that it appears to be a true branch—characters not known to occur in any other calamoid genus. The axes of the spikelets which are short and congested in each spadix-branch, are also thick; and the flowers

* The previous paper entitled THE GENUS DAEMONOROPS OF MALAYA, published in this Bulletin XIV Part 1 (1953) 49–147, should have borne also the general title as follows: PALMAE MALESICAE—XVII.

(male and female) and the fruit are also very much larger than in any other rattan genus. The fruit scales are not channelled in the middle.

The spadices in Schizospatha are much more abbreviated than those in Cornera and do not have a filiform appendix at the end. The primary spathes are papyraceous, often fragile, imbricate, longer than the included internode and the axillary branch, and gradually shorter towards the end of the spadix; this means that each spathe covers partly or entirely the one above, and that the longest internode and the largest spathe are the lowermost in the spadix, and the shortest are at the apex. Often the terminal portion of the spadix is abnormal; this may contain two or more spathes which though amplexicaul at the base, are open and cymbiform, each subtending in its axil an abortive or fertile spikelet. This entire abnormal part is wholly enclosed, before anthesis, in a large cymbiform, amplexicaul spathe. The tubular primary spathes do not dehisce but remain closed so that the spadix branches with their spikelets emerge by puncturing their respective axillant spathe on its dorsal side, a mode of orientation for spadix branches not known in any other rattan genus. Later, as the spikelets develop and the spadix bends, the spathes become torn and appear to have dehisced naturally, but the basal spathes will often reveal the true mode of emergence of the spadix branches. The spathes may be entirely unarmed or occasionally the lowermost spathe is armed at the base and obscurely so in the lamina.

CORNERA Furtado **gen. nov.**

Palmae scandentes, dioicae, flagelliferae. *Frondes* paripinnatae, subimparipinnatae vel subcirriferae. *Spadices* parvi, frondibus breviores vel eis aequilongi, in parte basali valde crassi, apice in appendiculum brevi unguiculatum exeuntes, feminei masculis similes sed minores, 1–3 ramis arrectissimis in axis directione principalis productis, crassis praediti. *Spathae primariae* persistentes, aculeatae, basi tubulares, apicem versus gradatim dilatatae, auriculiformiter explanatae, summo triangulariter truncatae vel acuminatae, vel longe rostratae. *Spiculae* breves, axi crassae, congestae. *Flores feminei,* neutri et masculi maximi, 5–10 mm. longi, ut in Calami speciebus dispositi. *Involucrophora* cupuliformia vel infundibuliformia; involucra conformia. *Perianthium fructiferum* campanulatum, ad basin fere usque divisum, haud pedicellatum. *Fructus* elliptici vel ovato-oblongi, inter species calamoideas maximi, 2·5–4 cm. alti, 2 cm. in diam.; squamis secus dorsum haud canaliculatis. *Semina* alte ruminata vel homogenea.

Distributio: Species hujus generis adhuc tres cognitae, in Malaya et in Borneo incolunt.

Species Typica: *C. pycnocarpa* Furtado.

KEY TO THE SPECIES

(a) Leaflets mealy white beneath (Seed deeply ruminate)
C. Lobbiana (Becc.) Furtado.

(aa) Leaflets not mealy white beneath

(b) Leaves 2–3 m. long, subcirriferous. Leaflets many, equidistant except in apical part of the leaf. Leaf-sheaths armed with many spines especially at the mouth. Fruit dark; seed deeply ruminate
C. conirostris (Becc.) Furtado.

(bb) Leaves ± 50 cm. long or less, almost as long as the spadices, paripinnate or rarely subimparipinnate, not subcirriferous. Leaflets few, 6–8 in all, inequidistant, 4 terminal approximate, the two central in the terminal group of leaflets being shortly united at base; other leaflets seated towards the base. Leaf-sheaths armed with a few small thorns, mouth unarmed. Fruit with brownish scales; seed homogeneous
C. pycnocarpus Furtado.

Enumeration of the Species

1. Cornera conirostris (Becc.) Furtado **comb. nov.**

Calamus conirostris Becc. in Hook. f., Fl. Brit. Ind. VI (1893) 461; Ridl., Mat. Fl. Mal. Pen. II (1907) 205; Becc. in Ann. Roy. Gard. XI (1908) 480 t. 220., Ridl., Fl. Mal. Pen. V (1925) 60: **Basinym**

C. brachystachys Becc. *sensu* in Ann. cit. (1908) 485 t. 222 quoad frondem tantum; Merr., Bibl. Enum. Born. Pl. (1921) 73 pro parte (ex altera parte = *C. Lobbiana*).

Stem scandent, tufted 6–10 m. long, 2·5–3·5 cm. thick including leaf-sheaths. *Leaf-sheaths* flagelliferous, armed with unequal, spreading, somewhat deflexed, straw-coloured, laminar spines, largest ones being 2–5 cm. long, those near the mouth being erect, narrower, linear, up to 18 cm. long. *Leaves* 2·5–3 m. long (including the 30–50 cm. long yellowish petiole), ending in a short, stout, strongly clawed cirrus bearing diminutive inequidistant leaflets. *Leaflets* ensiform, 1–3 costate, equidistant for the most of the lower part, 2–6 cm. apart, opposite or subopposite, largest 40–45 cm. long, 2·5–3 cm. broad.

Spadix 40–60 cm. long including a short appendix, with one or two flower-bearing branches; the lower branch stout, arrect bearing on each side about 7 reflexed, 2·5–3·5 cm. long spikelets. *Fruit* large about 3 cm. long, 2 cm. in diam., ovoid, conic, long beaked, covered with 15 series of black, shining scales, sometimes yellowish at base.

MALAYA: Perak, Tapah (Furtado 33,095; Ridley 14,113).

BORNEO: Sarawak, loc. incert., probably Kuching (Hewitt in 1906, vern. nom. *Rotang Tedong*); Mount Matang (Beccari leaf in t. 222).

1. Cornera conirostris (Furtado 33,095).

A, Petioli pars basalis cum vagina et flagello. B, Frondis fragmentum medianum. C, Frondis cirrus cum foliolis diminutis. D, Spadix. E^1, Spiculae pars ut dispositio involucrophori involucrique appareant. E^2, Involucrum ut ejusdem dispositio in involucrophoro appareat. F^1, Flos femineus ad anthesin. F^2, Fructus. G, Semen verticaliter discissum.

This species was not recorded from Borneo, BECCARI having referred the Bornean sterile material of this species to *Calamus brachystachys*. Hewitt's collection has a fruiting spadix and representative portions of a leaf which shows that *Cornera conirostris* does occur in Borneo.

BECCARI had apparently intended to include Scortechini's collection from Gopeng, Perak, among the syntypes of the basinym of this species, but this collection was not cited in the original publication by HOOKER who, while condensing BECCARI's descriptions for his Flora of British India, saw in the Kew herbarium only Kunstler's specimen and none from Scortechini's collection. The plate given by BECCARI (1908) is based entirely on Scortechini's specimens.

2. Cornera Lobbiana (Becc.) Furtado **comb. nov.**

Calamus Lobbianus Becc. in Hook. f., Fl. Brit. Ind. VI (1893) 462; Ridl., Mat. Fl. Mal. Pen. II (1907) 204; Becc. in Ann. Roy. Bot. Gard. Calc. XI (1908) 482 t. 221; Ridl., Fl. Mal. Pen. V (1925) 59: **(Basinym.)**.

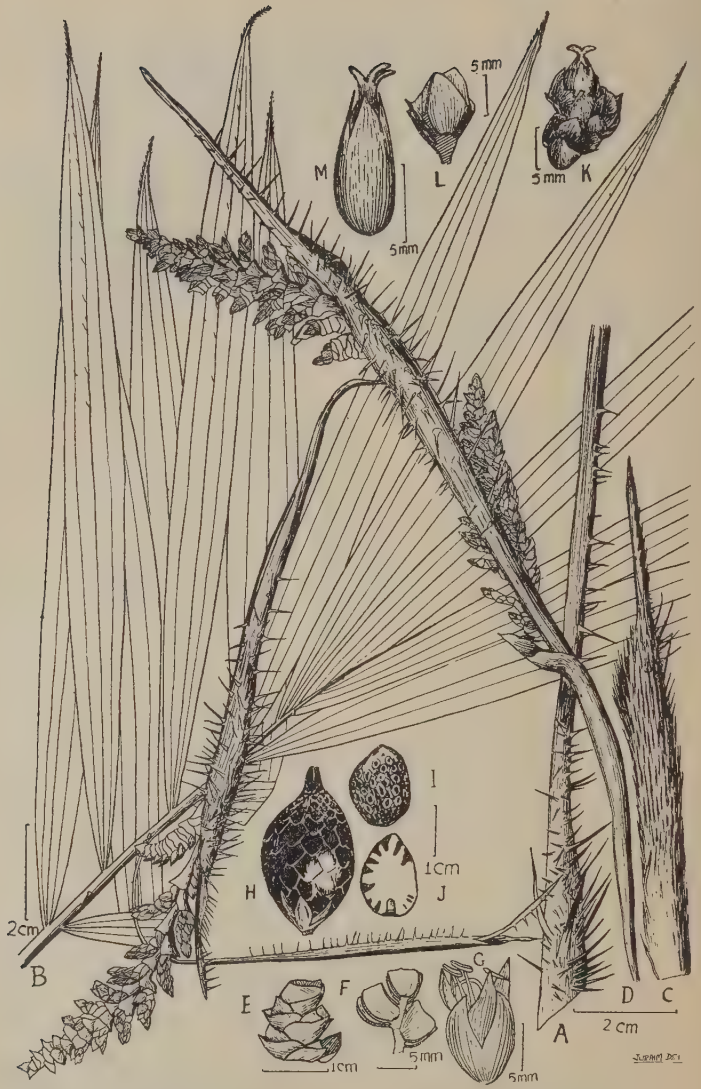
C. brachystachys Becc. in Rec. Bot. Surv. Ind. II (1902) 215; et in Ann. cit. (1908) 485 t. 222 quoad spadicem tantum (quoad frondem = *C. conirostris*): **syn. nov.**

C. melanocarpus Ridl. in Trans. Linn. Soc. Lond. III (1893) 392.

Stem short, solitary, 1–1·5 m. long, 2·5–3 cm. through with sheaths, scandent or semi-scandent. *Leaf-sheaths* sometimes flagelliferous especially when old and climbing, densely armed with unequal ascending or spreading, light coloured spines, the largest being 2–5 cm. long. *Leaves* non-cirriferous, 1·25–2 m. long. *Leaflets* paripinnate, ensiform, equidistant, conspicuously white beneath, 3-costulate, sometimes caudiculate at apex, 3–5 cm. apart, opposite or subopposite, the largest ones about 40–45 cm. long, 3·5 cm. broad, the two terminal shortly connate at base.

Spadix 40–60 cm. long including the appendix, usually divided into 1–3 erect branches bearing short congested spikelets, the female spadix being shorter and less branched; primary spathes long-beaked, spiny. *Fruit* large, 3 cm. long, 2 cm. in diam., ovoid conic, beaked, covered with black, yellowish at base, shining scales arranged in 15 longitudinal series, sometimes.

MALAYA: Kelantan, Sungai Keteh (Nur 11,987). **Pahang,** Bukit Kuman in Raub (Burn-Murdoch, comm. sub Ridley's no. 13,298); Tahan River (Mat on 21–IX–1893, vern. nom. *Rotan Chin Chin*); Pulau Tawar (Ridley on 10–VI–1891, Holotype of *C. melanocarpus*); Kuala Lipis at Ulu Chimeras (Burkill & Haniff 15,685). **Negri Sembilan,** Beremban by Sungai Bendol (Furtado 33,123, vern. nom. *Rotan Ayer,* both male and fruiting under the same number); Gunong Angsi, alt. 670 m. (Nur 11,598). **Johore,** between Gunong Belumut and Gunong Bechua, alt. 750 m. (Holttum 10,845); Castlewood (Ridley in VI–1904); Sungai Kayu Ara (Corner & Furtado 29,493);



2. Cornera Lobbiana (A–G: Furtado 33,123; H–J: Furtado 33,123a; K–M: Ridley s.n.).

A, Pars petioli. B, Fragmentum frondis apicale. C, Spatha primaria basalis. D, Spadix sine spatha basali. E, Spicula. F, Eadem spicula verticaliter discissa ut dispositio involucrophori involucrique appareat. G, Flos masculus. H, Fructus. I, Semen. J. Semen verticaliter discissum. K, Spicula feminea. L, involucrophorum cum spathella et involucro verticaliter discissum. M, Flos femineus cum calyce paulo longiore quam corolla.

Mawai-Jemaluang Road (Corner on 1–IX–1940); Batu Pahat (Ridley in IX–1900); Ulu Batu Pahat at Kampong Chin Chin (Lake & Kelsall in 1892, vern. nom. *Rotan Manana*); Gunong Panti (Ridley on 9–XII–1892); Ulu Sungai on Gunong Panti, alt. ± 100 m. (Nur (20,013). **Selangor,** Ginting Simpah (Hume 9,476); Petaling (Ridley on 5–VII–1889); Pahang Track (Ridley 8,776). **Singapore,** Selitar (Goodenough on 3–1–1889 and on 12–VIII–1890, spadices only; Ridley 1,665, leaves only); Bukit Timah (Ridley 8,961 and in 1890 & in 1907); Chan Chu Kang (Ridley in Nov. 1889); Pulau Damar (Mat in 1894).

BORNEO: Sarawak, Bau (Ridley 11,820); Matang (Ridley in VII–1903 & in VII–1905).

C. melanocarpus Ridl. was published with a meagre description in English in November 1893, that is, about a month and a half after the publication of *C. Lobbianus* Becc., so that the latter binomial has the priority. *C. brachystachys* Becc. was based on a fully developed fruiting spadix collected in Kuching in Sarawak, and as a fully developed fruiting spadix of *C. Lobbianus* was not available for him and as this species was not then recorded from Borneo, Beccari thought that this Kuching material represented a new species. Later he completed the description of *C. brachystachys* by adding to it the description of the leaf which he thought to be of the same species but which really belongs to *C. conirostris* Becc. = *Cornera conirostris* (Becc.) Furtado.

The male flowers show some variations; some develop and shed their pollen when the perianth is well opened, while others shed pollen when the perianth is closed. In some neutral flowers a few pollen grains may be seen and so it is possible that these grains are able to fertilise the female flowers from the same spadix.

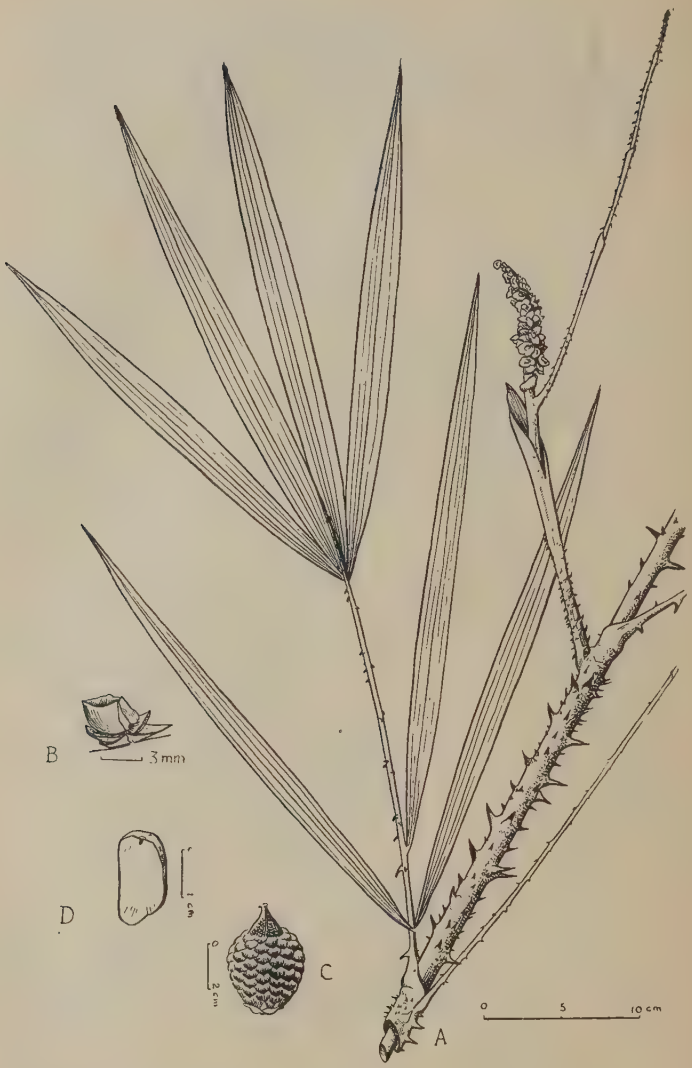
Female spadices sometimes also show various grades of abnormalities and the secondary spathes may be ligulate instead of being truncate as shown in the plate.

The syntypes of *C. Lobbiana* were collected in Singapore by Lobb and on Gunong Panti in Johore by King's collector.

3. Cornera pycnocarpa Furtado **spec. nov.**

Ab alteris hujus generis speciebus haec differt: aculeis vaginae frondalis minoribus paucioribus; petiolis basi minus aculeatis; foliolis paucioribus et minoribus, duobus apicalibus basi conspicue connatis; inflorescentiis partialibus spiculisque minoribus; fructibus obscure brunnescentibus, haud nigris politisque; albumine homogeneo vel superficialiter ruminato.

Caudex gracilis, scandens, caespitosus, 15 m. usque longus, cum vaginis circa 1·5 cm. in diam. *Vaginae* frondium flagelliferae, striatae, aculeis basi tumescentibus apicem versus valde angustatis, summo atrescentibus vel non, ascendentibus vel horizontalibus, solitariis vel interdum confluentibus, maximis 10 mm. longis, minimis 1 mm. usque



3. Cornera pycnocarpa (Corner 30,293).

A, Caudicis fragmentum cum folio et spadice. B, Involucrophorum cum involucro et spathella. C, Fructus. D, Semen verticaliter discissum (inversum).

longis armatae, apice oblique truncatae, infra petiolum geniculatae, in geniculo valde striatae parce aculeolatae vel non. *Ocrea* brevissima. *Frondes* subsessiles vel breviter petiolatae, 40 cm. longae, basin versus utrinsecus 1–2 foliolis suboppositis praeditae, apice in foliola 4 aequialta (duo centralia basi connata, altera inferiora libera) terminatae, secus rachidis dorsum aculeis reflexis 5 mm. longis armatae. *Foliola* circa 30 cm. longa, 3 cm. lata, lanceolata, 3–4 costulata, utrinque inermia, supra nervis transversalibus conspicuis subtus inconspicuis ornata apice penicillata.

Spadix femineus in appendicem flagelliformem brevem exeuns, inflorescentiam partialem unicam gerens, in parte pedunculari circa 20 cm. longus. *Spathae primariae:* basilaris unica fertilis, tubulosa, aculeolata, apice fissa, elongato-auriculiformis, summo abrupte acuminata; alterae spathae primariae infertiles, tubulares. *Inflorescentia partialis* 6 cm. longa, in latere dorsali scorpioideo reflexa floribus carens, in altero latere spiculis abbreviatis vel apicem versus floribus per circa 6 series congestis praedita. *Spathae secundariae* annulares vel in uno latere haud crescentes, apice truncatae scariosae; spathellae brevissimae vix visibiles. *Involucrophorum* cupuliforme; involucrum conforme. *Perianthium fructiferum* late campanulatum vel fere explanatum; segmenta calycis quam segmenta corollae latiora sed aequialta. *Fructus* elongato-ovoideus, apicem versus sensim attenuatus conoideus, circa 4 cm. longus, 2·5–3 cm. in diam.; squamis brunnescentibus, secus margines atrescentibus scariosis, dorso haud canaliculatis, per series verticales 15–18 dispositis. *Semen* ambitu ovale, applanatum, circa 12 mm. longum, 10 mm. latum, 8 mm. crassum; albumen aequabile vel superficialiter ruminatum; embryone basilare.

MALAYA: Kemaman, Ulu Bendong prope Kajang, alt. circa 150 m. (Corner 30,293).

This species is easily distinguished by its short leaves which are scarcely longer than the axillary spathes; by having 6–8 almost equal but inequidistant leaflets to each leaf, the four terminal leaflets forming a group; by having the two topmost leaflets shortly connate at the base; and by its homogeneous or superficially ruminate seeds.

In the specimens examined the spikelets are so small that the flowers appear to be seated directly on the axis of the branch. The male spadix has not yet been collected.

SCHIZOSPATHA Furtado **gen. nov.**

Palmae scandentes, flagelliferae, monoicae vel masculae. *Folia* ecirrifera, paripinnata. *Spadices* foliis paulo breviores, haud appendiculati, pauciramosi. *Spathae primariae* imbricatae, papyraceae, saepe inermes, indehiscentes, apice exsuccae, fragiles, loriformes. *Inflorescentiae partiales* breves, sessiles, spiculis paucis brevisque praeditae, spathis axillantibus breviores, basi spathae perforata exserentes. *Flores* in plantis monoicis uniquique feminei cum singulis masculis in eodem involucrophoro siti; flores masculi in plantis monoicis quam ei ex plantis masculis nonnihil minores. *Perianthium fructiferum* explanatum. *Fructus* squamiferentes, cum semine homogeneo.

Distributio: Genus adhuc monotypicum in Nova Guinea incolit.

Specimen Typicum: Carr 13,123 (Herb. Singaporense).

Contrary to the rules I have indicated here a type specimen for the genus, instead of mentioning a binomial that would include the type specimen. The reason for adopting this procedure is that for the generic group represented by this type specimen an older specific epithet has the right of priority under this genus. The holotype of *Calamus setigerus* Burret is Carr 13,123, the duplicates of which are found mixed in Singapore. Should there be found any specific or generic differences between the specimen seen by Burrett and the one seen by me, the generic name will have to retained for the holotype studied by me in making the genus.

Burret does not note the peculiar emergence of the spadix branches in *C. setigerus,* while *C. anomalus,* which he says to be a close ally, appears to be a true Calamus species.

Schizospatha setigera (Burret) Furtado **comb. nov.**

Calamus setigerus Burrett in Notizbl. Bot. Gart. Berlin XII (1936) 320 (**basinym**).

Caudex gracilis, scandens, probabiliter caespitosus, foliis exceptis omnino deciduo fusco-furfuraceus, circa 2 m. longus, cum vaginis 7–8 mm. in diam. *Vaginae* frondales flagelliferae, aculeolis minutis, 1–5 mm. longis, solitariis, numerosis, patentibus vel porrectis, atrescentibus, basi tumidis armatae, apice oblique truncatae, infra petioli basin geniculo inermi praeditae. *Ocrea* brevissima, coriacea, aculeolis conformibus paulo longioribus dense armata. *Folia* sessilia, ecirrifera, 25–33 cm. longa, paripinnata vel rarissime imparipinnata, utrinsecus foliolis 4 per greges 2 dispositis; 2 foliola in gregi basilari inter se valde approximata, opposita, longissima, 20–25 cm. longa, 15–22 mm. lata, anguste lanceolata, sub-3-costulata, utrinque inermia, secus margines tantum remote setosa; reliqua foliola omnino 4, rarissime 5, apice folii dense juxtaposita, basalibus breviora, conformia, circa 15–17 cm. longa, 15–22 mm. lata, dua (vel rarissime tria) centralia basi breviter connata; nervis folioli transversalibus utrinque conspicuis; rachides inter foliola basilaria et apicalia nudae, subtus aculeis solitariis reduncis armatae.

Spadix monoicus gracilis, folio paulo brevior, sed rachide folii longior, 20–30 cm. longus, in pedunculo aculeolatus, ceterus inermis vel rarissime apicem versus in axi obscure aculeolatus, ramos 3–4 (praeter apicales ramos diminutos) gerens. *Spathae primariae* 4–6 imbricatae, plerumque in apicem loriformem primum involutam dein explanatam exeuntes (in parte spadicis abnormali apicali spathae primariae minutae, cymbiformes, apertae, basi amplectentes, ante anthesin in unica spatha cymbiforme longa saepe inclusae); basalis spatha fertilis ventricosa, vel infertilis indundibuliformis haud ventricosa, basin versus coriacea inermis vel aculeolata, superne exsuccosa, plerumque inermis, rarissime aculeis paucis, obscuris armata, alterae spathae (apicalibus minutis abnormalibus exclusis) imbricatae, ventricosae, gradatim minores, exsuccosae, inermes, saepe fragiles. *Rami primarii* omnino dense fusco furfuracei, axi angulares, breves, sessiles, 3–4, basi spathae perforata exserti, reflexi; basilares alteris longiores, ad 2–5 cm. usque longi, utrinsecus 3–4 spiculis alternatis axi flexuosis angularibus praediti (rami in parte spadicis abnormali in spathis cymbiformibus

4. Schizospatha setigera (Carr 14,421 ♂).

A, Caudicis fragmentum cum foliis et spadice masculo. B, Inflorescentia partialis. C, Flos masculus. D, Idem apertus ut staminum dispositio appareat.

5. Schizospatha setigera (A–D: Carr 12,123; E–K: Carr 14,422)

A, Caudicis fragmentum cum foliis spadiceque. B, Inflorescentia partialis cum fructu immaturo. C, Fructus maturus. D^1, Semen. D^2, Idem verticaliter discissum. E, Spicula ut flores feminei et masculi appareant. F, Flos femineus. G, Sepala ejusdem. H, Flos femineus apertus ut petala et staminodia appareant. I, Ovarium ejusdem. J, Flos masculus ex eadem (E) spicula. K, Flos idem apertus ut petala et stamina appareant.

manentes). *Spathae secundariae* breves, stricte tubulares, apice ligulatae; spathellis conformibus. *Involucrophorum* calyculiforme, bidentatum; involucrum conforme, irregulariter 2–3 lobatum, interdum ad basin imbricatum. *Areola* floris masculi lunata. *Flores feminei* circa 3–3·5 mm. longi, 1·5 mm. in diam., elongato-ovati; calyx quam corolla paulo brevior, in lobis striatis, ovato rotundatis, mucronatis divisus; corolla 3-partita, cum lobis striatis; staminodia membranacea, 6, basi ½-connata. *Flores acolyti* masculi, ante femineorum anthesim pro majore numero maturi, 3–3·5 mm. longi, 1·5 mm. in diam., elliptici; calyx quam corolla ½-brevior, lobis ellipticis striatis praeditus; corollae lobi lato lineares; stamina 6, basi ½-connata. *Perianthium fructiferum* explanatum. *Fructus* oblongus, sine rostro minuto 14 mm. altus, 10–12 mm. in diam.; squamis per series 14–15 verticales dispositis, obscure stramineis, infra margines luteo-lineatis, secus margines et apice atrescentibus, dorso canaliculatis. *Semen* 11–12 mm. altum, 9–10 mm. latum, 6–7 mm. crassum, cum fovea lanceolata; albumine homogeneo; embryone basilari.

Spadix masculus femineo similis, sed gracilior. *Spathellae* anguste ligulatae. *Involucrum* minutum, vix exsertum, concavulum, lobis acutis 3 praeditum. *Flores masculi* circa 3 mm. longi; calyx striatus, 3-lobatus, 1/3 brevior quam corolla; lobi corollae striati elliptici vel elongato ovati, apice acuti; stamina 6, basi breviter connata.

NOVA GUINEA: Papua, Boridi, circa alt. 1500 m. (Carr 14,421 male, & 14,422 monoecious, & 13,123 male and fruiting mixed).

The collector remarked that the stamens in the monoecious spadix were smaller than those in the male spadix, and that they were always white in the fresh state.

William Farquhar's Second Book of Drawings of Malacca Plants

By I. H. Burkill, M.A., F.L.S.

A short account was given in 1949 (this Bulletin 12, pp. 404–407) of a book of illustrations of Malacca medicinal plants presented in 1827 to the Royal Asiatic Society by Lieut.-Col. William Farquhar. A second book exists and is the subject of this note.

William Farquhar, it will be remembered, was the first Resident and Commandant of Singapore; he had been Resident of Malacca previously and while there had employed a Chinese artist to make for him illustrations of useful plants in an attempt to learn to know them. His second book may be divided into three sections; the first rattans, the second the results of an ascent of Mount Ophir, and the third trees valuable for their timber or resins. I have attempted to identify his plants portrayed as there is an interest in knowing on what jungle produce Malacca was living. The artist excelled in painting foliage; and twigs must have been brought to him for the purpose. Some of the trees he may have known in the forest but he did not attempt to paint them from life; instead he drew and coloured trunks and branches in what may be called diagrams. There is only one representation of a flower and that erroneous and three of the fruit. A Malay wrote in arabic characters the plant names except where I indicate this below. These names and the foliage are in truth all that a botanist has to guide him in determinating the plants.

Farquhar was proud of his attempt and took the drawings with him in December 1818 when he went under instructions to join Raffles at Penang; and William Jack was shown them, who commented to Wallich in a letter that 'they are deficient in many essential points .... but will be extremely useful as a guide, by taking the native names .... and making enquiries accordingly'. Farquhar showed them later to Wallich who made some shots at naming a few. This would be in 1822 in which year Wallich resided for a short time in Singapore. Someone, probably Farquhar himself, shewed them to Lindley whose handwriting is against one. This would be in London and just before they were given to the Asiatic Society.

I report on them, by their numbers.

1, rotan pĕrachit. A rattan, if not *Daemonorops angustifolius* Mart., then near it. The word pĕrachit, indicating the shrub *Ervatamia,* suggests that this particular rattan supplied sap used along with the juice of *Ervatamia* on the darts of the blow-pipes of the Mantera. The name rotan pĕrachit has not been recorded elsewhere; and it may be that the Mantera having gone, the use and with it the name have gone.

2, rotan batu. The illustration is satisfactory for *Calamus insignis* Griff. and the malay name is right for it.

3, rotan jĕrĕnang. *Daemonorops* sp., doubtless one of those which yield Dragon's Blood, as the malay name indicates.

4, rotan sĕga badak. *Calamus ornatus* Griff. Griffith figured the same from Malacca, his editor erroneously passing the misprint ruga for sĕga.

5, rotan kĕrtang. *Daemonorops grandis* Mart., the commonest rattan in the Malay Peninsula.

6, rotan sĕmut. *Korthalsia scaphigera* Mart. The malay name is not exactly distinctive, being given to several species whereon ants frequently nest.

7, rotan tunggul. A reasonable figure for *Plectocomiopsis geminiflorus* Becc. Griffith used the same name for the same plant.

8, rotan manau. *Plectocomia griffithii* Becc. The application of the name rotan manau varies, but covers this species.

9, rotan kĕmangdong. A species of *Calamus*.

10, rotan dahanan. *Korthalsia rigida* Blume. Again the malay name is not absolutely distinctive; it refers to the branching of the inflorescence.

11, rotan sĕmambu. *Calamus scipionum* Lour. The malay name covers more than one species; but only those which give the most excellent canes.

12, rotan sisir. Possibly *Calamus griffithianus* Mart.

13, rotan gĕlam (by error for gĕlang). The plant drawn has the characters of *Daemonorops verticillaris* Mart.

14, rotan pinang-pinang. *Pinanga disticha* Blume. The possibility of using the stem to furnish a walking stick is the only reason for calling it a 'rotan'. Pinang-pinang is a well known name.

15, rotan gĕtah. A *Daemonorops* very like no. 1 above. The malay name indicates similar uses.

16, rotan sĕga. *Flagellaria indica* Linn. The stem of this plant is smooth (sĕga); but rotan sĕga is a name reserved as a rule for the large stemmed rattans, while this is rotan dini. The stem is used for sewing ataps.

SERIES 2—The plants from Mount Ophir.

17, (without a name). *Dacrydium beccarii* Parl.

18, (in latin characters mesullon). *Leucopogon malayanus* Jack. Wallich on seeing the figure recognized it. Farquhar's artist misrepresented the flowers but knew that they should be white. Wilkinson's Dictionary holds the name mensalang for an unidentified plant.

19, (without a name). *Matonia pectinata* Br. Wallich wrote against the figure '?Aspidium Farquharianum—Wall. mss'.

20, the outline of a drawing of Leucopogon.

21, altogether unrecognizable.

SERIES 3—forest trees; in general the earlier are sources of timber and the later of resins.

22, mĕrbau. *Intsia bakeri* Prain, or Malacca teak, a valuable timber.

23, kĕlat merah. *Eugenia,* probably *E. chlorantha* Duthie, the flowers of which have crimson stamens.

24, pĕtaling. *Ochanostachys amentacea* Masters. This tree seems to have very great value in the country behind Malacca, the Benua using it for their houses and only one other kind of timber besides (see Newbold, Brit. Settlem. in Malacca 2, p. 27; 1839).

25, pĕnaga. *Mesua ferrea* Linn., a very hard timber.

26, Kĕlat puteh. *Eugenia* sp., near *E. pendens* Duthie.

27, dali-dali. *Scorodocarpus borneensis* Becc., a very valuable timber tree.

28, kĕmeyan. *Styrax benzoin* Dryand., the source of benzoin.

29, sugu. A tree with foliage such as *Adinandra dumosa* Jack has. No name such as sugu is recorded.

30, mĕdang buaya. A tree with opposite leaves which cannot be determined from the drawing.

31, mĕdang sĕminyak. A tree with narrowly ovate leaves, rounded at the apex, which cannot be recognized. The malay name is attributed elsewhere to *Ehretia,* possibly erroneously.

32, mĕdang kĕtanahan. A Lauracea and possibly a species of *Dehaasia.*

33, bilian. A Sapotacea, but not *Payena utilis* Ridl., it might be a *Madhuca.*

34, gaharu. *Aquilaria malaccensis* Lam.

35, bintangor ,bunga. *Calophyllum* sp., probably *C. pulcherrimum* Wall.

36, kempas. Unrecognized.

37, pĕndarahan. One of the several species of the Myristicaceae that occur in Malacca. It is impossible to say which of them.

38, labelled 'chengai batoo'. The individual leaves are like those of an *Alstonia* but not disposed properly to represent it.

39, tembusu. *Fagraea fragrans* Roxb.

40, labelled 'minja crooing' i.e. minyak keruing. *Dipterocarpus baudii* Korth.

41, labelled 'dammar batoo'. It seems to be a species of *Hopea.*

42, labelled 'damar batoo'. A different species of *Hopea.*

The Germination and Longevity of Seeds in an Equatorial Climate

By ANNE GARRARD PH.D.

Department of Botany,
University of Malaya

Introduction

SINGAPORE IS situated 1° 17″ North in latitude on the South side of Singapore Island. It has very uniform temperature, high humidity and copious rainfall (Colony of Singapore Annual Report). The mean temperature of the coolest month (December) is only 3°F lower than the hottest (May). The absolute minimum is 70°F and the absolute maximum 93°F, but these are rarely reached. The normal range is 75°–80°F on a wet day and 74°–89°F on a dry day. (Holttum, 1953). The rainfall is between 85 and 118 inches per year. Its distribution varies from year to year, but there is a maximum fall in the months December–January and generally a short period of drier windy weather in late January or February. However, a month in which less than 2·5″ rainfalls is rare, and occurs about every two years in the February–March or the July–September periods.

Crocker and other workers at the Boyce Thompson Institute have made extensive investigations on the conditions most favourable for the storage of seeds and have found that most seeds require a low temperature and a low moisture content. (Crocker, 1948). The climate of Singapore may be expected to be unfavourable since the temperature and humidity are relatively high. Moreover, Singapore is characterised by having a continuous growing season. During the whole year the conditions are favourable for germination. The ability for seeds to undergo a period of dormancy during unfavourable conditions (as in temperate or monsoon climates) is not an essential feature for the survival of plants grown here. However, a large number of locally grown plants have been imported from other more seasonal climates and have seeds which normally undergo a resting period before germination takes place. Some such seeds may require a period of 'after-ripening' before germination can occur. It may be that the climate

is not suitable for this to take place and seed propagation of such plants cannot occur here.

It is probable that the majority of seeds germinate shortly after they reach the ground, but it is interesting to investigate the survival period of those which may have fallen in a place unfavourable for germination. Such results are also interesting from the horticultural point of view since a gardener may not find it convenient to plant freshly gathered seed immediately. Seeds which do not degenerate under Singapore conditions in storage can be safely stored until required.

Experiments

Ripe seeds of various local and imported tropical plants were collected and carefully dried by exposure to the air. The percentage germination of the sample was obtained by placing a number (which varied from 20–150 according to the availability of the seed) on filter paper in a petri dish. The filter paper was kept moist throughout the experiment with distilled water. Certain seeds showed a tendency for mould infection and these were first washed with 2 per cent saturated mercuric chloride for two minutes and then in running water. The final washing was in distilled water. The seed samples were stored in glass specimen tubes with tightly fitting corks. At monthly intervals a number of seeds was removed from each sample and the percentage germination found as before. An equal number was scarified by scraping the testa with a scalpel and these were placed in another germinator.

Results

1. Percentage Germination/Age

The *total percentage germination* was taken to be the percentage of the total number of seeds employed which germinated in a reasonable period of time. In general, germination was complete in a few days, but 50 days were necessary for fresh seeds of *Asclepias curassavica* L. and a longer time was required for fresh seeds of *Dianella ensifolia* Red. (108 days). These two cases illustrate the need for a dormant period by some fresh seed. The time required for germination of older samples kept a few months in storage was much shorter.

There is no significant difference between the results for unscarified and scarified seeds, hence the long time required for germination is not due to slow permeability of the seed coat. The seeds as collected were not ready for immediate germination and required a period of after-ripening.

TABLE I

Age of Sample	0 month	1 month	2 months	3 months
Asclepias curassavica L.				
No. of days before germination begins ..	35	21	15	10
No. of days for total per cent germination ..	50	30	21	15
Total percentage germination	100	100	100	100
Dianella ensifolia Red.				
No. of days before germination begins ..	108	61	35	—
No. of days for total per cent germination ..	108	65	42	—
Total percentage germination	100	100	26	—

The results for scarified seeds in the case of Asclepias curassavica L. were as follows:—

TABLE II

Age of Sample	0 month	1 month	2 months	3 months
No. of days before germination begins ..	36	19	13	9
No. of days for total per cent germination ..	48	27	25	20
Total percentage germination	100	100	100	100

It was not possible to obtain results for scarified seeds in the case of *Dianella ensifolia* Red. since scratching of the coat seemed to interfere with the normal process of germination, causing distorted growth. It is interesting to note that the total period required

for germination to take place whether the seeds are kept in the wet germinator or dry in storage is roughly the same. However. dry storage is unfavourable, and after 2 months storage the percentage germination was reduced to 26. After 3 months none of the seed was viable.

TABLE III

Period required for germination of Dianella ensifolius Red.

DRY		WET	TOTAL
0	+	108	108 days
31	+	65	96 „
62	+	42	104 „

It seems that these seeds require a considerable period of after-ripening before they can germinate. If the dry storage is too long there is degeneration. For best results these seeds should be planted not later than a month after they have been gathered.

The following table gives the total per cent germination of various species after certain periods of storage. The seeds in each case were gathered from the fruiting plant as far as could be judged immediately prior to the normal dispersal time. Unless all seeds germinated immediately samples were left at least 50 days in the germinator before the total per cent was calculated. In the following table the percentage germination of scarified seeds is only given if it differs significantly from the unscarified results.

A large number of species which show an initial high percentage germination degenerate rapidly on storage in the Singapore climate. The seeds of *Melastoma malabathricum, Muntingia calabura. Fagraea fragrans, Nepenthes gracilis* and *Nephelium malaiense* will not remain viable after a month in dry storage. The first four named possess very small seeds which may not be able to withstand such conditions of imposed dormancy. In the case of *Nepenthes gracilis* seeds kept for only 14 days failed to germinate. *Nephelium malaiense* is, on the other hand, a tree of Malayan origin, and climate makes it possible for immediate germination of the seeds. The seeds lack the ability to remain dormant over even a short period of time, but possession of such a character would have no particular selective advantage.

TABLE IV

Name	Family	PER CENT GERMINATION AFTER MONTHS STORAGE										
		0	1	2	3	4	5	6	7	8	9	10 mths.
Abroma augusta L.	Sterculiaceae	100	80	60	0	0	0	..	..	..	..	..
Achras Zapota L.	Sapotaceae	50	8	0	0	0	..	..	..	..	..	..
Adenanthera pavonina L. (not scarified)	Leguminosae	100	62	41	30	18	9	5	3	0	0	0
(scarified)		100	100	100	100	100	100	100	100	100	100	100
Allium odorum L.	Liliaceae	100	81	61	44	12	0	0	0	..	..	..
Asclepias curassavica L.	Asclepidaceae	100	100	100	100	100	100	100	100	100	100	100
Basella rubra L. (not scarified)	Chenopodiaceae	75	62	3	0	..	..	..	..	..	..	..
(scarified)		80	65	0	0	..	..	..	..	..	..	..
Bixa orellana L.	Bixaceae	100	100	100	100	100	0	0	0	..	..	..
Calliandra haematocephala Hassk.	Leguminosae	100	81	26	0	0	..	..	0	..	..	..
Carapa guianensis Aubl.	Meliaceae	100	100	100	0	0	0	0	..	..	..	..
Cassia mimosoides L.	Leguminosae	100	100	100	100	51	12	0	0	..	..	..
'Cooperanthes' (Cooperia X Zephyranthes)	Amaryllidaceae	100	63	0	..	..	..	..	..	..	..	..
Cordia cylindristachys Roem. and Schult. (not scarified)	Boraginaceae	33	45	35	40	36	42	28	0	..	..	..
(scarified)		67	65	63	60	61	60	68	42	0	..	..
Cosmos sulphureus Cav.	Compositae	30	25	12	0	0	..	..	..	..	..	..
Dianella ensifolia Red.	Liliaceae	100	100	26	0	..	..	..	..	0	..	..
Fagraea fragrans Roxb. (with fresh sap)	Loganiaceae	100	0	0	..	..	..	..	..	..	..	..
Gossypium arboreum L.	Malvaceae	100	70	21	0	0	..	..	..	..	..	..
Hippeastrum equestre Herb.	Amaryllidaceae	614	405	221	167	0	0	..	..	..	..	..
Melastoma malabathricum L. (washed)	Melastomaceae	90	0	0	0	0	..	..	..	..	..	..
Muntingia calabura L. (washed)	Tiliaceae	615	0	0	0	..	..	..	..	..	..	..
Nepenthes gracilis Korth.	Nepentaceae	83	0	0	..	..	..	..	..	..	..	..
Nephelium malaiense Griff.	Sapindaceae	33	0	0	..	0	..	..	..	..	..	..
Ocimum basilicum L.	Labiatae	100	100	75	48	0	..	..	..	..	..	..
Pithecolobium affine Baker	Leguminosae	100	100	100	100	100	61	23	0	0	..	..
Quamoclit pinnata Boi.	Convolvaceae	24	35	20	39	40	19	35	125	10	15	..
Ricinus communis L.	Euphorbiaceae	100	100	100	100	100	100	100	100	100	100	100
Spathodea campanulata Beauv.	Bignonaceae	100	100	94	80	72	55	31	27	20	18	15
Urena lobata L. (not scarified)	Malvaceae	80	73	68	59	50	56	42	40	..	..	35
(scarified)		70	81	75	93	100	97	86	100	..	..	100
Zephyranthes tubispatha Herb.	Amaryllidaceae	100	95	83	0	0	..	..	..	..	..	..

Note:—The seeds of *Fagraea fragrans* Roxb. failed to germinate unless supplied with fresh fruit sap. All the other seeds were tested in the absence of any fruit sap. In the case of *Melastoma malabathicum* L. and *Muntingia calabura* L. extra washing was required, since the presence of a low concentration of the fruit sap may modify the results. This will be the subject of a further communication.

The following table gives the time required for the whole sample to become inviable.

TABLE V

Time for Complete Degeneration

0–1 month	1–2 months	2–3 months
Melastoma malabathricum L. Muntingia calabura L. Nepenthes gracilis Korth. Nephelium malaiense Griff. Fragraea fragrans Roxb.	Achras zapota L. 'Cooperanthes'	Abroma augusta L. Basella rubra L. Calliandra haematocephala Hassk. Gossypium arboreum L. Carapa sulphureus Cav. Dianella ensifolia Red. Zephyranthes tubispatha Herb.
3–4 months	**4–5 months**	**5–6 months**
Hippeastrum equestre Herb.	Allium odorum L. Bixa orellana L. Ocimum basilicum L.	Cassia mimosoides L.
6–7 months	**7–8 months**	**9 months and over**
Pithecolobium affine Baker.	Cordia subcordata Lam.	Asclepias curassavica L. Adenanthera pavonina L. Quamoclit pinnata Boj. Ricinus communis L. Spathodea campanulata Beauv. Urena lobata L.

Seeds of *Asclepias curassavica* L. can be kept for at least 10 months without any degeneration of the seed (100 per cent germination after 10 months storage). In the case of *Adenanthera pavonina* L. the seeds also remain viable but become irreversibly impermeable with time, and if they are more than 8 months old do not germinate at all unless the testa is cracked. This may be the reason why Guppy (1912) states that these seeds are impermeable, and that Corner (1949) emphasises the importance of strong-beaked birds, such as parrots, in cracking the hard red coat prior to germination. However, not all fresh seed of Adenanthera is impermeable. Some seeds will germinate immediately, and others

will germinate at varying intervals over a long period which may exceed 6 months—the period between the production of one crop of seed and the next.

Quamoclit pinnata Boj. does not give a good initial germination (24 per cent) but at 9 months 15 per cent of the seed is still viable. *Ricinus communis* L. parallels *Asclepias curassavica* L. in its behaviour. Scarified seeds germinate more quickly, but the final percentage germination is the same. The testa of *Ricinus communis* L. is 'slowly permeable' and scratching of it reduced the time required for germination. *Spathodea campanulata* Beauv. shows 100 per cent germination initially but after 10 months only 15 per cent is obtained. *Urena lobata* L. remains viable but the testa becomes impermeable. Such change in permeability of the testa is a very good adaptation to this climate in which permeable seeds degenerate rapidly (most of those listed above are permeable). Seeds which are initially permeable can germinate rapidly if the conditions are suitable, but if this is not the case the testa may become impermeable which will enhance the keeping properties of the seed.

TABLE VI

Name	AGE IN MONTHS										
	0	1	2	3	4	5	6	7	8	9	10 mths.
Abroma augusta L.	8	7	9	..	..	..	..	..	..	..	..
Achras zapota L.	15	15	..	..	..	..	..	..	..	..	..
Adenanthera pavonina L. (not scarified)	1	2	1	1	1	2	1	1	..	..	..
(scarified)	1	2	1	1	3	1	1	1	1	2	1
Allium odorum L.	2	3	2	2	3	..	..	..	..	..	..
Asclepias curassavica L.	35	21	15	10	8	9	10	7	10	9	8
Basella rubra L. (not scarified)	13	12	14	..	..	..	..	..	..	..	..
(scarified)	9	12	..	..	..	..	..	..	..	..	..
Bixa orellana L. (with aril)	3	2	4	2	3	..	..	..	..	..	..
(without aril)	3	2	4	5	3	..	..	..	..	..	..
Calliandra haematocephala Hassk.	2	1	2	..	..	..	..	..	..	..	..
Carapa guianensis Aubl.	14	12	14	..	..	..	..	..	..	..	..
Cassia mimosoides L.	1	1	1	1	1	2	..	..	..	..	..
'Cooperanthes'	6	6	..	..	..	..	..	..	..	..	..
Cordia subcordata Lam. (not scarified)	14	14	10	18	10	14	12	..	..	..	..
(scarified)	16	15	18	14	12	13	18	20	..	..	..
Cosmos sulphureus Cav.	3	5	2	..	..	..	..	..	..	..	..
Dianella ensifolia Red.	108	61	35	..	..	..	..	..	..	..	..
Fagraea fragrans Roxb.	12	..	..	..	..	..	..	..	..	..	..
Gossypium arboreum L.	3	3	2	..	..	..	..	..	..	..	..
Hippeastrum equestre Herb.	10	11	10	10	..	..	..	..	..	..	..
Melastoma malabathricum L.	5	..	..	..	..	..	..	..	..	..	..
Muntingia calabura L.	10	..	..	..	..	..	..	..	..	..	..
Nepenthes gracilis Korth.	11	..	..	..	..	..	..	..	..	..	..
Nephelium malaiense Griff.	7	..	..	..	..	..	..	..	..	..	..
Ocimum basilicum L.	3	2	4	3	..	..	..	..	..	..	..
Pithcelobium affine Baker	4	4	3	4	4	3	4	..	..	..	..
Quamoclit pinnata Boj	2	3	2	4	5	5	2	3	3	3	3
Ricinus communis L.	3	3	3	3	3	3	3	3	3	3	3
Spathodea campanulata Beauv	4	5	5	4	6	6	6	6	5	6	6
Urena lobata L.	8	5	4	4	4	4	4	5	4	4	4
Zephyranthes tubispatha Herb.	11	10	11	..	..	..	..	..	..	..	..

Cordia subcordata Lam. may be placed in a class of 'variably permeable' (Guppy 1912). It seems that 30–40 per cent of the seeds gathered are permeable and germinate without scarifying the endocarp, about 30 per cent are impermeable but viable, and about 40 per cent are inviable.

2. Time taken for Germination/Age

Two times were recorded in each instance—(*a*) the time taken after the seed is placed in the germinator before germination begins; (*b*) the time for all viable seeds to germinate.

(a) The time in days before Germination begins/age of Seed

Except for *Asclepias curassavica* L. and *Dianella ensifolia* Red. which have been described previously, provided some seeds remain viable storage does not affect the time taken for germination to begin. Table VII gives the time from planting for all viable seeds to germinate.

(b) The time for total percentage Germination (Table IV) Age of Seed

TABLE VII

Name	AGE IN MONTHS										
	0	1	2	3	4	5	6	7	8	9	10 mths.
Abroma augusta L.	8	8	9	..	..	..	..	..	..	..	..
Achras zapota L.	20	19	..	..	..	..	..	..	..	..	..
Adenanthera pavonina L. (not scarified)	436	101	72	53	21	10	5	4	..	..	..
(scarified)	3	4	4	5	5	4	4	3	..	..	..
Allium odorum L.	16	16	18	16	17	..	..	..	..	..	..
Asclepias curassavica L.	50	30	21	15	..	..	..	..	..	..	..
Basella rubra L.	23	20	14	..	..	..	..	..	..	..	..
Bixa orellana L. (with aril)	7	5	4	7	4	..	..	..	..	..	..
(without aril)	4	3	4	5	5	..	..	..	..	..	..
Calliandra haematocephala Hassk.	2	3	2	..	..	..	..	..	..	..	..
Carapa guianensis Aubl. (not scarified)	20	19	21	..	..	..	..	..	..	..	..
(scarified)	7	6	7	..	..	..	..	..	..	..	..
Cassia mimosoides L.	4	5	4	4	4	4	..	..	..	..	..
'Cooperanthes'	6	6	..	..	..	..	..	..	..	..	..
Cordia subcordata Lam. (not scarified)	20	15	20	20	10	16	21	..	..	..	..
(scarified)	17	22	19	21	15	18	18	21	..	..	..
Cosmos sulphureus Cav.	5	7	8	..	..	..	..	..	..	..	..
Dianella ensifolia Red.	108	65	42	..	..	..	..	..	..	..	..
Fagraea fragrans Roxb. (with fresh sap)	16	..	..	..	..	..	..	..	..	..	..
Gossypium arboreum L.	3	4	4	..	..	..	..	..	..	..	..
Hippeastrum equestre Herb.	16	18	14	17	..	..	..	..	..	..	..
Melastoma malabathricum L.	10	..	..	..	..	..	..	..	..	..	..
Muntingia calabura L.	26	..	..	..	..	..	..	..	..	..	..
Nepenthes gracilis Griff.	14	..	..	..	..	..	..	..	..	..	..
Nephelium malaiense Griff.	7	..	..	..	..	..	..	..	..	..	..
Ocimum basilicum L.	5	6	7	5	..	..	..	..	..	..	..
Pithcelobium affine Baker	4	4	4	4	4	4	4	..	..	..	..
Quamoclit pinnata Boj.	3	5	4	3	6	7	6	5	5	6	3
Ricinus communis L.	3	3	3	3	4	3	3	3	3	3	3
Spathodea campanulata Beauv.	13	10	11	13	14	10	11	6	12	13	11
Urena lobata L. (not scarified)	18	12	6	4	3	4	4	4	4	3	4
(scarified)	2	3	4	5	4	4	4	4	5	4	4
Zephyranthes tubispatha Herb.	11	10	11	..	..	..	..	..	..	..	..

In general, storage does not alter the time required for all viable seeds to germinate. A change in the time period required appears to be due to two factors. The fresh seeds may be immature, e.g. *Asclepias curassavica* and *Dianella ensifolia,* or there may be a change in the permeability of the seed coat, e.g. *Adenanthera pavonina* and *Urena lobata.* When a large sample of *Adenanthera* seeds is collected from the fruiting tree and 100 or so seeds are placed in the germinator, they do not all germinate immediately as the following data shows.

Percentage germination of fresh *Adenanthera* seeds/time in days.

TABLE VIII

After	1 day	1%	germination	After	50 days	60%	germination
„	2 days	3%	„	„	74 „	66%	„
„	3 „	4%	„	„	87 „	69%	„
„	4 „	5%	„	„	105 „	72%	„
„	5 „	8%	„	„	124 „	78%	„
„	7 „	16%	„	„	139 „	82%	„
„	8 „	19%	„	„	154 „	86%	„
„	9 „	20%	„	„	155 „	87%	„
„	10 „	21%	„	„	169 „	89%	„
„	11 „	22%	„	„	180 „	91%	„
„	12 „	23%	„	„	183 „	92%	„
„	14 „	29%	„	„	189 „	93%	„
„	26 „	39%	„	„	196 „	94%	„
„	28 „	41%	„	„	208 „	95%	„
„	31 „	48%	„	„	293 „	97%	„
„	33 „	52%	„	„	392 „	99%	„
„	36 „	56%	„	„	436 „	100%	„
„	39 „	56%	„				

If however, 100 seeds are scarified and placed in the germinator all germinate in 4 days. It seems that a sample of freshly gathered *Adenanthera* seeds consists of about 5 per cent immediately permeable seeds, but the other seeds will become permeable in damp conditions. In this way the time of germination of any one crop of *Adenanthera* seeds is spread over a long period of time even if the seeds fall immediately on ground suitable for germination. If the seeds are cracked by strong-beaked birds, etc., they will germinate immediately. In dry storage however, the seeds become irreversibly impermeable but not inviable (since they germinate when scarified). The time needed for the few seeds which can still become permeable even if not scarified to germinate is reduced.

Fresh seeds of Adenanthera	*Wet conditions*	*Dry conditions*
(impermeable)	All germinate with time. (become permeable)	Will not germinate after 8 months. (become impermeable)

The testa of *Carapa guianensis* is not impermeable but is sufficiently thick to hinder germination. The unscarified fresh seed takes 20 days to germinate whereas the scarified ones can be induced to germinate in 7 days. *Urena lobata* is like *Adenanthera* in its behaviour. The seed-coat tends to become impermeable in dry storage, and after 10 months only 35 per cent unscarified seed will germinate. The seed-coat of fresh seed causes some delay in immediate germination (18 days is required as compared with two in the scarified sample), and as with Adenanthera dry storage tends to cause the coat to become irreversibly impermeable.

Discussion and Conclusions

Akamine (1951) conducted an interesting series of experiments on the seeds of *Tristania conferta*. As a result he was able to plot graphs of per cent germination against years of storage at 3 different temperatures (45°F, 59°F and 75°F), coupled with 3 different humidities (30 per cent, 75 per cent and 90 per cent). He showed clearly that the seeds kept best at the lowest temperature, but the keeping capacity was greatly reduced at high humidities. The results for 75°F need only concern us here, although the temperature of storage of the seeds described above was rarely as low as this. At 30 per cent humidity 2/3 of the originally viable seeds germinated after 4 years storage; at 75 per cent humidity nearly all the seeds failed to germinate; and at 90 per cent humidity germination failed to occur if the seeds were kept for only 9 months. The last conditions (90 per cent humidity and 75°F) can be compared with the conditions normally present in Singapore. For the greater part of a 24 hour period the humidity is well above 90 per cent and is only reduced to 60 per cent for a few hours on a hot, sunny day.

The results above indicate that in the high humidity and high temperature conditions of Singapore the seeds of most species tested failed to remain viable after a nine months period of storage. It may be inferred from the results of previous workers that under more favourable climatic conditions the seeds would remain viable for a longer period. However it is to be noted that a number of the species tested are plants of an equatorial climate in which there is a continuous growing season. In such a climate there is no selective advantage of seeds which can remain ungerminated for long periods of time. It may be that such seeds cannot be stored ungerminated even under conditions of lowered temperature and humidity. On the other hand the physiological activities

of the seed may be so slowed down that the seed *accidentally* possesses the property of longevity. Such conditions of low temperature and humidity will never occur in the plants' natural environment and natural selection has played no recent part in the acquirement of this character.

Summary

1. The percentage germination of 28 species of locally grown plants was determined immediately after collection and after storage at monthly intervals up to 10 months.
2. The high humidity and relatively high temperature conditions were unfavourable for the storage of seed. Only 6 species had seed which remained viable until the end of the 10 month period. There was rapid degeneration in small seed and seed of trees of Malayan origin.
3. The seeds of *Dianella ensifolia* Red. and *Asclepias curassavica* L. were not fully mature when collected and required a period of after ripening.
4. The permeability of the seeds of *Adenanthera payonina* L. and *Urena lobata* L. decreased under storage in air but the viability of the seed did not decrease since there was no change in the percentage germination of scarified seed.
5. When seeds of *Adenanthera pavonina* L. are placed in a germinator they do not all germinate immediately and may require a period exceeding a year before they have all germinated. Scarified seed all germinate within 4 days. The damp conditions render the testa more permeable in unscarified seed but the time before this occurs varies from seed to seed.

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Acknowledgements

The writer gratefully acknowledges the assistance received from Professor R. E. Holttum and colleagues on the Staff of the Department of Botany, University of Malaya, during the course of the investigation.

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SINGAPORE

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PUBLICATIONS OF THE BOTANIC GARDENS SINGAPORE

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1. **The Agricultural Bulletin of the Malay Peninsula** (Old Series) nos. 1–9, 1891–1900 (out of print).

2. **The Agricultural Bulletin of the Straits and F.M.S.** (Second Series, monthly issues) Vols. 1–10, 1901–1911. Most numbers are available, price 50 cents each or $5 per volume.

3. **The Gardens' Bulletin, Straits Settlements.**

   Vol. 1 nos. 1–5, January to May 1912 (as *Agricultural Bulletin* of the Straits and F.M.S., Third Series); nos. 6–12, December 1913—March 1917 (as *The Gardens' Bulletin, S.S.*).
   Vol. 2 nos. 1–6, July 1918—January 1920; nos. 8–12 June 1920—August 1921 (no. 7, April 1919 out of print).
   Vol. 3 nos. 1–12, August 1923—March 1925.
   Vol. 4 nos. 1–12, June 1926—January 1929.
   Vol. 5 nos. 1–12, August 1929—June 1932.
   Vol. 6 nos. 1–15, (issued as parts 1–3) December 1929—October 1930.
   Vol. 7 parts 1–3, September 1932—June 1934.
   Vol. 8 parts 1–4, October 1934—October 1935.
   Vol. 9 parts 1–4, December 1935—March 1938.
   Vol. 10 parts 1 and 2, January 1939—August 1939.
   Vol. 11 parts 1–3, May 1939—August 1941.

4. **The Gardens' Bulletin, Singapore.**

   Vol. 11 part 4, September 1947.
   Vol. 12 part 1, April 1949.
   Vol. 12 part 2, December 1949.
   Vol. 13 part 1, June 1950.
   Vol. 13 part 2, September 1951.

The above former issues of the Gardens' Bulletin may be purchased from the Botanic Gardens, Singapore, at $5 per volume or 50 cents per number for vols. 1–5 (Vol. 6 of 15 numbers, $7.50); in some cases two or more numbers were published together. Vols. 7–11 are published at $8 per volume. The prices of parts vary according to their size. The parts are published at irregular intervals, as material is available.

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12306—350—2 55